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[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF EDITOR, WRINKLE DEPARTMENT,
CLEVELAND, O., April 5, 1904.

This department is now open and ready for contributions, which will be presented at the Twenty-seventh Annual Meeting, to be held next June in St. Louis, Mo.

The active co-operation of all members and friends is earnestly solicited. Please forward contributions to the Editor at once.

W. E. STEINWEDELL, Editor.

BRIEFLY TOLD.

THE RIGHT MAN IN THE RIGHT PLACE.—The Western Gas Association has selected Mr. Fred. R. Persons, of Toledo, O., to have charge of its technical display of the gas industry in St. Louis at the World's Fair. The Association and its executives are to be congratulated over their choice, for there is no one more widely known in gas circles, or more generally popular either, than the genial travelling man from Toledo. His long experience in the gas appliance business and his breadth of mental and physical temperament insures the fact that the exhibit will be watched with diligence and explained with facility and accuracy, relieved from all taint of tedium. Mr. Persons takes charge at the opening of the Exposition next Saturday, and will be found thereafter throughout the term, in "Section 33-A, Liberal Arts Building, Louisiana Purchase Exposition, St. Louis." He may be addressed as the representative of the Western Gas Association upon any question concerning the exhibit thereof by anyone therein interested on and after the day named. Prior thereto all communications should be addressed as heretofore to Mr. Frederick H. Shelton, Pennsylvania Building, Philadelphia. Of course, this appointment does not mean that Mr. Persons proposes to relinquish any other position that he now holds.

A PLEASANT GATHERING.—A belated editorial correspondence note, is the following, which came to hand just too late for our issue of last week: "Dear JOURNAL: Some days ago the associate members of the Guild of Gas Managers gave an elaborate luncheon, at Young's Hotel, Boston, to the active members and several other guests. The tables were beautifully decorated with flowers and ferns, and around the festive board (or boards) sat three-score-and-ten men whose smiles not only did not come off, but which actually grew broader as the afternoon waned. 'Happy Harry Norton,' the President of the Associates occupied the post of director, seated at the center of the head table, almost hidden behind an enormous bouquet presented him by a few of his admirers. On his right stood a meter tester filled with coffee cocktails, which it was thought had done service in another room before the banquet. All records are now lost, however. After appropriate and happy remarks Mr. Norton delegated Mr. Chas. H. Baldwin to preside as toastmaster, who, knowing his victims well, struck the chord with which he vibrated in unison. Like in a large family, the remarks were frank and much mirth and laughter were provoked. Amongst

LIBRARY OF CONGRESS. APR 25 1904 SMITHSONIAN REPORT.

the speakers were Commissioner F. C. Barker, Chas. F. Prichard, Walter R. Addicks, Wm. A. Wood, S. J. Fowler, Wm. E. McKay, J. A. Mayers, Wm. McGregor, D. J. Collins and C. M. Coburn. Selections appropriate to the speakers and their speeches were rendered by the orchestra and sung by the diners. The occasion signally displayed the fine feeling of fellowship that undoubtedly exists between the Actives and the Associates of the Guild. Handsome souvenirs were placed at each plate, and every 'man present was glad he was not absent.'"—M.

NOTES—

A CORRESPONDENT in Hamburg, Pa., writing under date of the 21st inst., says: "At the present rate of work the new plant of the Hamburg Gas Company will likely be in full operation by the latter part of May. The close of this week will see the practical completion of the gas house by Contractor Raubenhold, the strong winds of the past few days having somewhat interfered with work on the roof. It is a model structure, strongly built and modern in its appointments. On Monday morning a gang of 10 men from the Logan Iron Works, Brooklyn, began work on the erection of the steel gasholder, which will be 42 feet in diameter, with a capacity of 200,000 cubic feet. They expect to have the work completed within 2 weeks. Much of the apparatus—the horizontal boiler, the generating apparatus, purifying boxes, condenser, scrubber, and other material—has been delivered on the ground and will be erected on foundations as quickly as the building is under roof. In the meantime the laying of the gas mains throughout the borough progresses rapidly. Contractor Sutherland has some 40 men at work and they practically open and close a square each day. Contractor Raubenhold has started the erection of a frame building for the use of the Company as an office and display room, on the property of Dr. Wagner, on North Third street, near State. The building will be 16 by 24 feet, with 10-foot ceiling, and will be equipped for the demonstration of gas for light and fuel. The Company will have a large line of gas fixtures and gas ranges and other appliances, from which selections can be made."

WRITE to the Jeffrey Mfg. Company, of Columbus, O., for a copy of its circular, No. 73. It is worth examining.

A CORRESPONDENT in Alton, Ills., writing from there the 20th inst., reports that the Alton Gas Company recently had much trouble with its main system. Continuing, he says: "As a result of the leakage so encountered the new piping (it was laid only a year ago) the Company has a large force of men at work recaulking and, in fact, relaying the pipes. This will have to be done from Belle street west to State street on Main street and will represent considerable expense to the Gas Company. It will also be necessary on Eighth street, from Alby to Ridge streets, and over other parts of the city where new gas mains were laid a year ago under Supt. H. O. Shannon, who has since been succeeded here by Supt. H. McGuire. The expense, Mr. McGuire states, will represent about $200 per week to the Company and the work will last indefinitely or until all the leaks have been repaired."

LAST week U. S. geological statistics were made public that place the world's production of petroleum in 1902 at 185,151,069 barrels. Of this the United States and Russia produced 91.44 per cent. For years Russia has led in point of production, but an increase of 19,377,722 barrels in the production of the United States in 1902 and a decrease amounting to 4,628,515 barrels in the production of Russia caused the two countries to change places and put the United States at the head of the list. The United States produced nearly 2.6 barrels of refined petroleum in 1902 for every barrel produced by the rest of the world.

ACCORDING to a despatch from Rochester, N. Y., dated the 20th inst., negotiations are now in progress looking toward a combination which will result in uniting the control of the Rochester Gas and Electric Company, Rochester Light and Power Company and Rochester Railway Company. An expert examination of the plants has been made, but all of the details of the plan have not been formulated for submission to the stockholders.

THE Gas Machinery Company, of Cleveland, O., has been awarded the contract for the reconstruction of the coal gas works at Alpena, Mich.

THE Carlisle (Pa.) Gas and Water Company has declared a semi-annual dividend of 3 per cent. On Monday, June 20th, a special meeting of the shareholders will be held for the purpose of declaring whether or not the stock and bonded indebtedness of the concern shall be increased.

[REVISED BY THE SECRETARY.—Continued from page 610.]

TWENTIETH ANNUAL MEETING, OHIO GAS LIGHT ASSOCIATION.

HELD IN THE HOLLENDEN HOTEL, CLEVELAND, O., MARCH 16, 17 AND 18, 1904.

FIRST DAY—MARCH 16.—AFTERNOON SESSION.

The President called upon Mr. Irvin Butterworth, Editor of the

PROGRESS DEPARTMENT,

to present his report thereon, which he did as follows:

To the Members of the Ohio Gas Light Association: Having been re-elected by you at your last meeting to serve as Editor of your Progress Department for another year, I herewith respectfully submit a *resumé* of the more important technical and mechanical improvements that have been made in gas manufacture, distribution and consumption since we last met so far as I have been able to ascertain and describe them.

My report of a year ago attempted to cover the developments of the preceding 5 years. Allowance must, therefore, be made if my present report should seem relatively meager, or if the progress recorded therein should not be so great or important as that disclosed by my former report. As a matter of fact, the advancements of the past 12 months will compare very favorably indeed with those of any preceding year in the history of the gas business, and their contemplation will dispel any misgivings lest the technique of gas manufacture and distribution is not keeping pace with the rapid progress that is now being made in the commercial end of the business. For instance, we are indebted to Mr. Frederic Egner for the information, which he has obtained for us by personal and painstaking research in the Patent Office at Washington, that the patents pertaining to gas manufacture and distribution that were issued by the United States Patent Office during the past year were fully one-half as many as were granted during the entire period prior to 1888. He also furnishes us with the following itemized list or classification of the gas patents issued during the past year, which is extremely interesting as indicating the present trend of gas invention in this country:

Gas engines, or gas engine attachments	217
Acetylene gas (mostly generators)	81
Incandescent gas burners or appliances	52
Gas making process (mostly producer gas)	46
Gas governors and valves	31
Heaters and stoves, or burners for same	30
Purifiers, and a few coke ovens	27
Air gas machines, or appliances for same	8
Inclined retorts	4
Coke conveyors	3
Gas analyzing apparatus	2
Miscellaneous (burners, cocks, lamps, meters, etc.)	123
Total	624

It is most interesting also, in this connection, to know that in Great Britain during the past year 310 patents relating to the gas business have been issued, as against 240 in 1902 and 259 in 1901. While the greatest number pertained to incandescent gas lighting, and the next greatest to gas engines, yet a review of the British patents is significant in showing that much more attention than for many years is now being given to improvement in gas works plant and processes.

It is evident that there has been unusual interest and activity in gas invention during the past year on both sides of the water. Progress in the development of the gas engine has been especially marked, due largely to its increasing use with producer and blast furnace gases, but partly also to the expiration of the principal Otto gas engine patents. Acetylene generators still constitute an attractive subject for the inventor, and incandescent gas burners and appliances carried off third honors in this country in the number of gas patents issued. However, the greatest progress in the gas business is not necessarily in the direction indicated by the largest number of patents issued. As stated above, the most important progress of the past year (aside possibly from that made in gas engines) has probably been in gas works plant and processes, particularly in respect to machinery for charging and drawing retorts and for conveying coal and coke. The number of by-product coke oven plants is also increasing, and this system is a factor of growing importance in the matter of gas supply for the larger cities. Improved methods of distribution, including the high pressure system, are being rapidly adopted, and outdoor incandescent gas lamps have been

greatly improved and developed during the past year. The number and variety of industrial gas appliances are also rapidly increasing, and the scope and possibilities of this branch of the gas business have been strikingly shown by the recent publication by a Western gas company of an industrial gas appliance catalogue which, by its magnitude and completeness, is a revelation to gas men themselves of the adaptability of gas to innumerable industrial purposes. Last year's Progress Report contained a list of a large number of industrial uses to which illuminating gas is being applied, and this list may now be increased as follows:

Heating pipe dipping.
Relining locomotive cylinders.
Welding tires of small express wagons.
Matrix drying.
Heating macaroni presses.
Rosin melter for bicycle manufacture.
Tinning and galvanizing furnaces.
Sweep reducing furnace.
Instrument sterilizers.
Dressing sterilizers.
Water sterilizers.
Bottle sterilizers.
Barbers' sterilizers.
Crematory for hospital refuse.
Barrel heaters.
Small hot air engines.
Core drying ovens.
Mould drying burners.
Carving tables.
Ham and meat broilers.
Rendering kettles.
Turkey roasters.
Inside heated soldering irons.
Coffee roasters.
Popcorn poppers.
Drop carving machine (for furniture making.)
Can capping and tipping machines.
China kilns.
Fruit renovators.
Incubators.
Steam generators for drying tables, etc.
Varnish boilers.
Tube soldering furnaces.
Leather-sewing machines.
Process letter machines.
Steam cloth spongers.
Operating vapor baths, etc.

The above list, added to last year's, makes a very suggestive array of present industrial gas uses. Some of the gas companies of this country, including at least one large one, are now selling as large a proportion as two-thirds of their gas for purposes other than illumination, with a satisfactory increase also in the illuminating branch of their business.

Another manifestation of the present tendency toward progress is the intelligent and careful attention which gas companies are beginning to give to the daily operation of their coal gas benches with respect to their fuel consumption, the largest single item of gas works expense. Until recently, flue gas analysis, as a means of securing maximum fuel economy in gas works, was almost unheard of and seldom practiced, but now, and especially within the past year, many gas companies are making daily or frequent flue gas analyses to their great advantage.

The adoption of at least tentative standard specifications for testing fuel gas appliances, which is a reform consummated within the past year, is a significant and important forward step. And last but not least, there has been a marked and much needed improvement in the working methods of some of the Gas Associations of this country.

The following are some of the specific improvements of the past year:

Charging and Drawing Machinery.—During the past year there have been great interest, progress and development in all kinds of gas works machinery, especially charging machinery. In this country, aside from the companies operating inclined retorts and by-product coke ovens, those in the following cities are now using drawing or charging machinery, or both, as shown by the following list:

Charging machinery only: Montreal.

Drawing machinery only: Cleveland, Indianapolis, Newark, Worcester, Buffalo.

Both charging and drawing machinery: Cincinnati, New York, Toronto, Philadelphia, Mount Vernon, Detroit, Milwaukee.

The following makes of machines are now in use in this country: Charging ond discharging: Bronder, Ross, West.

Discharging: Arrol-Foulis.

Charging: DeBrouwer.

Charging machines are now being operated in this country that charge 4 retorts simultaneously, and discharging machines are operated that discharge 4 retorts simultaneously. Combined machines are also being made that both charge and draw, as may be required, either 3 or 4 retorts simultaneously. In Europe especially there has been great activity during the past year in the development of charging and drawing machinery. The latest forms of charging machines do not convey the coal into the retorts but "project it in, either by centrifugal blowers, turbines or fans, or from a rapidly moving belt. Retorts 20 feet long are being successfully charged in this way, notably at La Villette works of the Paris Gas Company, where an electrically-driven turbine projector is used. The DeBrouwer projector is in operation in the cities of Bruges, Belgium, and Derby, England, and perhaps elsewhere. It is electrically driven, and throws the coal into the retorts from a rapidly moving horizontal belt, on to which the coal is fed from an elevated hopper. A machine of this make is now also being used, experimentally at least, in New York city. A firm in Stuttgart is also building what they call the "Kobold" charger, which can also be operated by electricity, and which throws the coal into the retorts by a system of rapidly revolving fans. Other types of centrifugal projectors for charging retorts are also being perfected, such as the Fiddes-Albridge and Wise machines, both patented in England last year.

The claimed advantages of this general method of charging are that: (1), It is adapted to small gas works; (2), the coal is placed with absolute evenness and nicety in the retorts; and (3), retorts of any length, within reasonable limits, can be charged by the same machine.

There seems to have been less activity in the development of discharging machinery than of charging machinery, but a notable improvement in the former is the discharging ram now used at La Villette works in Paris, and in Derby, England, which pushes the coke out of the through retorts from one end. Notwithstanding the retorts are 18 and 20 feet long, the coal is charged with such evenness by the turbine and belt projectors that the coke can be easily pushed out in this manner, as it could not be with any other form of charging. Furthermore, the retorts can be almost completely filled with coal, resulting in obvious economies and advantages. In these works the projector is operated at one end of the retorts and the discharging ram at the other.

Inclined Retorts.—The advance made in machines for charging and drawing horizontai retorts has rendered the wisdom of iustalling inclined retorts still more doubtful than it was a year ago. Engineers are proceeding cautiously, and it seems to be the part of conservatism just now to await the developments of the immediate future before adopting on a large scale either of the two systems, although the chances are apparently in favor of the horizontals. In England only 7 patents pertaining to inclined retorts were taken out last year, and only one of them refers to the retorts or settings proper, the others pertaining to buildings, conveyors, etc. Only 4 inclined retort patents were taken out in the United States during the past year, and they were obtained by foreign inventors. However, some notable advances have been made during the year, both in this country and in Europe, in the utilization of old retort houses with low roofs for the installation of inclines that were previously supposed to absolutely require high roofs. During the past year the inclined retorts built during the previous year at Lynn, Mass., have been put into successful operation, and inclined installations have been built during the year at New Bedford, Mass., and Lynchburg, Va., the latter being the smallest installation of inclines in the country; viz., 3 benches of 6's. A low-roofed retort house is used and the retorts are to be heated by producer gas made in isolated producers outside the building. The Consolidated Gas Company, of New York city, is about to install an inclined retort plant having a daily capacity of 10,000,000 cubic feet.

Through Retorts.—With the advent of improved charging and drawing machinery there are evidences of a revival of the through retort construction. One retort builder in this country is now prepared to erect through retorts 20 feet long, adapted to the use of a charging machine at one end and a discharging ram at the other.

Vertical Retorts.—An interesting and promising experiment has been in progress during the past 18 months at Exeter, England, with the revival of an old idea of placing the retorts in an upright instead of in a horizontal position. Only one such retort was originally installed for the purpose of this experiment, but the results are so favorable that an installation of 6 such retorts is now being made at these works. The coal is fed into the retort by a plunger which introduces about 6 pounds of slack every 100 seconds. This installation is what is called the "Settle-Padfield" system. Another system of vertical retorts is also about to be tried in England, while a third installation, on still another system, has been determined upon at one of the Berlin gas works. The results at Exeter indicate that an increased yield per ton of 2,000 to 3,000 feet of gas may eventually be secured by the vertical system.

Small Retorts.—Duriug the past year a multitubular retort setting was patented in England, contemplating the placing of a large number of very small horizontal retorts in one bench, with the view of obtaining higher yields and better qualities of gas. A bench of 20's has been installed at East Greenwich.

Bench Construction.—One bench builder has perfected plans for benches of horizontal 8's so constructed that he claims that no clinker will be formed and that there will be no danger of cracking flue tiles while renewing the retorts and settings. The subject of better grades of fireclay goods for benches is being agitated by several companies, and there will doubtless soon be much improvement along this line, as indeed there has been during the past year. One manufacturer is already putting 4 different kinds of materials in his bench work, vary-

ing the quality according to the usage or exposure to heat to which the different parts are to be subjected.

A new form of recuperator tile has also been patented in this country, the tiles being interlocked, thus protecting the joints and making a simple, solid and tight construction.

The Crystal Palace Gas Company, in London, is now making its own firebrick and fireclay specials, with apparently economical results. The main flue in inclined benches is now being placed inside instead of outside the benches, thereby economizing floor space.

There have been some improvements in the ironwork of benches during the year, particularly as to the method of anchoring the buckbars at the bottom and tying them together at the top. Attempts are being made to standardize and reduce the number of different sizes of mouthpieces. Two or 3 companies having retorts in vertical rows have connected each row of mouthpieces with one straight standpipe, which greatly facilitates the cleaning of the standpipes. One of these companies has a patented pneumatic standpipe cleaner for cleaning these straight pipes. It is suspended from the roof trusses, and is very successful in its operation, keeping the standpipes perfectly clean with a minimum of time and expense.

A new device has been perfected during the past year for scurfing retorts. It involves the simultaneous introduction into the retort of a combination of steam and compressed air, and by its use the carbon in a retort is loosened up in less than 1 hour.

Producer Gas.—Progress has been made during the year in the manufacture and application of producer gas, but for prudential reasons announcement cannot yet be made of some of the improvements. Standard producers are being arranged for the use of bituminous coal, and there has been introduced a small suction gas producer, using anthracite or coke, of sizes as low as 10-horse power. These suction producers operate without a gasholder, and are coming into special favor in Germany and France. Several plants are now making producer gas out of wood. Methods of producer gas manufacture are becoming more flexible, adapting the plants to the manufacture of various kinds of gases according to the purposes for which they are to be used.

Coal and Coke Conveying Machinery.—There has been considerable progress during the past year in the development of telpherage and other systems for conveying coal and coke. A movable telpher track now permits the storing of coal or coke in either rectangular or circular spaces and taking it from same to boilers, etc. Coke conveyors combining the use of exhaust fans for withdrawing the steam and smoke, the coke being quenched while in the conveyors or otherwise, have been improved during the year. The application of electricity to conveyors handling coal, coke and ashes in straight lines, curves and up-grades, is a development of the past year. The cost of maintenance of conveying machinery is being decreased, as well as the power consumption. In one works all the coal and coke products are handled automatically by electric motors. During the past year one gas works in this country has installed an electric storage battery locomotive for handling the cars on the tracks in and about the works.

Tar, Naphthaline and Cyanogen Extractors.—There have been improvements in the drum of the P. & A. tar extractor, and other forms of tar extractors have also been improved somewhat. Two different concerns in this country are preparing to build naphthaline extractors. The reversible condenser invented a few years ago by Mr. Charles Carpenter, of the South Metropolitan Works, London, England, for the extraction of naphthaline, is still in successful use. No American gas companies are as yet recovering the cyanogen from their gas, although one concern in this country is prepared to build apparatus for this purpose. There seems thus far to be more theorizing than practice, the world over, in the matter of the extraction of cyanogen. Authorities are still arguing as to whether cyanogen can be produced more cheaply by synthetic methods than by extraction from gas, and certain other authorities are warning the gas men of the limitations of the world's market for cyanides.

Ammonia Washers.—Every year seems to mark some improvement in ammonia washers as made by the various manufacturers. One concern has just brought out a washer that seems to carry the refinements of this apparatus further than ever before, subdividing the gas into extremely small jets, giving it a double washing and yet permitting so slow a velocity that but little entrained water is carried forward with the gas. Washers of other makers have been similarly improved. The rotary brush scrubber has also been improved in some details, such as the adjustment of overflows to prevent the liquor in one chamber from mixing with that in the next, means for the quick removal of the brushes, and so improving the brush construction as to increase the actual scrubbing surface.

Water Gas Apparatus and Processes.—During the past year one manufacturer has improved his carburetter by making it of larger diameter (the same size as the generator) and placing the up-take flue inside the carburetter instead of outside as heretofore, the bottom of this flue constituting a large ash-receiving chamber, which is fitted with a cleaning door at the bottom. This improvement enables the carburetter and superheater to be placed closer together, permitting shorter connections, and making a neater appearance. A blast box is now placed on the side of the shell immediately above the internal flue, from which the air is forced in at a right angle with the ascending generator gas, contributing to a uniform distribution of the combustion over the entire surface of the checkerbrick. The former divided blast arrangement has been further improved by the addition of special steam distributers between the bearing bars, insuring uniform distribution of the steam under the entire surface of the grate. Another firm of water gas apparatus manufacturers have brought out what they call a "twin generator apparatus," for the manufacture of low grade water gas. A useful and suggestive paper was presented during the past year, by Mr. G. W. McKee, to the Canadian Section of the Society of Chemical Industry, on "The Economic Admission of Steam to Water Gas Producers of the Lowe Type." The author calls attention to the economic results to be obtained by gradually diminishing the admission of steam during the run. During the past year the claimed advantages of the Lewes system of passing blue water gas through coal gas retorts during carbonization have been challenged, and Mr. Walter R. Jones, Engineer of the Rome Gas Works, has patented a method of gas manufacture that exactly reverses the Lewes method, in that he introduces coal gas into the water gas generators, where the mixing of the gases takes place, and the combined gases are then taken to the superheating chambers, where the hydrocarbons are fixed in gaseous form. It is claimed that economies are thus obtained by the enrichment of the gas with the hydrocarbons of the tar. I have obtained no data as to improvements in the Dellwik-Fleischer system of water gas manufacture, but the following quotation from a paper, contributed last October to "The Engineering and Mining Journal," will be of interest: "The water gas plant mostly used in Europe is the Dellwik-Fleischer system, over 80 plants of that type being in continuous operation. By this process water gas costs less than by previous processes, the yield being 35 to 40 cubic feet per pound of coke or anthracite. The working of the apparatus is safe and simple."

Fuel Economizers.—The manufacturers of a well known fuel economizer adapted for use in connection with water gas plants, report that they have made several improvements therein during the past year. At Madison, Wis., 12 per cent. of the boiler fuel is saved by heating the boiler feed water with the exhaust gases from a large gas engine that is used for generating electric current.

Oil Gas Apparatus and Processes.—These are used chiefly in California with the heavy oils now being produced there in large quantity. The gas works employing the latest oil gas apparatus use no solid fuel whatever, except the coke that is made from the oil itself in the process of manufacture, which coke is used under the boilers. During the past year an economical method has been discovered for coking the lampblack with which the gas made from this oil is heavily charged. The coke made from the lampblack in an oil gas works having a capacity of 30,000 feet per day or over is sufficient to generate all the steam used in the works. The oil gas apparatus, as made by one concern, is simply a modification of the ordinary water gas apparatus, in which the generator is omitted altogether, its place being taken by two carburetters with special design of checkerbrick and burners, and having a scrubber of special design, made necessary by the large quantity of lampblack which the crude gas contains. The total consumption of oil per 1,000 cubic feet of finished gas is about 11 gallons. About 40 California cities and towns are now being supplied with this oil gas, some of them among the largest in the State; and the total increase in oil gas production during the past year is about 2,000,000 cubic feet per day.

Exhausters.—No radical improvement in exhausters has been made during the past year, but some very large units have been built. One that has recently been installed in a gas works in a large Western city has a displacement of 52 cubic feet per revolution, and is direct connected to a high-speed Westinghouse gas engine of 300-horse power, designed to run at the rate of 200 revolutions per minute against a 5-pound pressure, pumping 8,000 to 10,000 cubic feet of gas per minute into medium-pressure gas mains. Another large exhauster built last year has a displacement of 300 cubic feet per revolution, is designed to operate against 4 pounds pressure and weighs 140,000 pounds. Experience is said to show that these large units operate against pressures up to 5 pounds with about 75 per cent. of the power required for piston ma

chines of the same capacity. A Pittsburg concern has brought out a new exhauster speed regulator, and the manager of an Eastern gas company has also recently adopted an improved device for this purpose.

Purifying Boxes and Apparatus.—Each passing year shows some advance in purifying apparatus. The use of dry seal boxes is increasing, and considerable improvement is being made therein. The placing of purifying boxes out-of-doors is also increasing, two large gas companies in this country having built such outside boxes last year, leaving them entirely unprotected and exposed to the weather with no bad results. The fact seems, therefore, to be still further established that purifying houses are unnecessary. An English gas company has effected a saving of 10 to 15 per cent. in first cost of the usual 4-box construction by leaving no space between the boxes, and by putting the center valve above the boxes where the 4 inner corners meet. A large gas company in this country erected during the past year an outdoor box of novel construction, resembling the upper lift of a gasholder. No iron whatever is used in the interior of the box, the usual trays being dispensed with, the oxide being supported by wooden slats resting on wooden supports. The box is filled and emptied through doors in the side. In two other American cities novel forms of purifying trays were introduced, consisting of 2 layers of boards placed flatwise, the 2 layers being separated by cleats or slats of wood, and the boards in the top layer covering the joints or spaces between the boards of the bottom layer. A large manufacturer of trays reports that the tendency is strongly toward heavier trays, 1½ to 2-inch instead of 1-inch as formerly. Cement purifiers were built during the past year in 2 or 3 cities in this country, saving their owners from 33⅓ to 50 per cent. in first cost as compared with the usual iron box construction. Improvements in valves and systems for reversing the flow of gas through the boxes have been made during the past year, these systems now being made very flexible, permitting the handling of the gas in a great variety of ways as circumstances may demand.

Prospective Processes.—There is some quiet talk on both sides of the water about the proposed manufacture of a gas similar to natural gas, consisting chiefly of methane or marsh gas, and a patent was taken out in England last year on a process of this sort. Another process is promised that will completely gasify any carbonaceous material. The Mazza separator, an Italian invention, is being discussed, which is said to enrich air with oxygen by a centrifugal mechanism that takes advantage of the different gravities of the constituents of the atmosphere. The inventors claim that a saving of 22 per cent. in boiler fuel has been effected by supplying the boiler with air thus enriched.

By-Product Coke Orens.—Improvements during the past year in by-product coke oven apparatus consist of machines for leveling the coal in the ovens, formerly done by hand, and an apparatus for the more effective control or separation of the gases evolved in the coking process, especially when a portion of the same is to be used for illuminating purposes. There are now 341 more ovens in operation in this country than there were January 1st, 1903. Several thousand by-product coke ovens are now being built in Europe, and the following is a list of new ovens now being built in this country, including additions to plants in operation: Buffalo, N. Y., 564; Chester, Pa., 40; Chicago, Ills., 120; Cleveland, O., 66; Duluth. Minn., 50; Dunbar, Pa., 30; Geneva, N. Y., 30; Lebanon, Pa., 90; Milwaukee, Wis., 80; South Sharon, Pa., 140; Tuscaloosa, Ala., 40; total, 1,250.

Tar.—Some use has been made of tar in Europe during the past year for laying dust on roads. The use of tar for the manufacture of tar macadam for street paving purposes is also increasing in this country. Experiments are being made, with promising prospects, in the use of tar for the manufacture of briquettes for fuel. The American Coal Products Company estimates that the total tar production of 1904 in this country will be 40 per cent. more than it was in 1903.

The manufacturers of a well known bitulithic pavement report the increase in their business as follows: 1901, 14,400 square yards; 1902, 255,000 square yards; 1903, 901,000 square yards.

Quick Sulphur Determinations.—Two or three methods for making quick sulphur determinations of coal and coke are being or have been developed during the past year, and one of them is described in the American Gas Light Journal, June 11th, 1903, which admits of 2 or 3 complete determinations per hour. One of the other methods will be announced later this year by the discoverer.

Photometry.—There seems to be nothing new in the way of photometry beyond the increasing interest in the Simmance-Abady "flicker" photometer, the principle of which was discovered by Prof. O. N. Rood 10 years ago, but the photometer itself did not come into prominence until within the past year or two. It is a very interesting instrument, said to reduce the "personal error," and to enable the operator to accurately measure the relative intensities of two sources of light of different qualities or colors. The increasing use of incandescent gas lighting and electric arc lighting has made a photometer of this sort a desideratum. Only one of these instruments, so far as I can ascertain, is now in use in this country, and the operator is by no means pleased with it, although foreign gas journals and gas men speak very highly of them. The International Photometer Commission is still engaged upon the task of fixing upon a standard method of photometry, but thus far seems to be doing preliminary work. There is now being perfected in this country a device for making rapid candle power determinations, but as it is not yet complete no report can be made upon it at the present time.

Since the above was in type, I have received the following from Prof. C. P. Matthews, of Purdue University:

"Marked progress has been made in industrial photometry during the past year. The advance has been along two lines; namely, the perfection of photometric methods, and the establishment of a working standard of light. Improvement in photometric methods has been chiefly in the perfection of photometers which yield the mean spherical candle power at one sitting, thereby shortening the process of making a spherical measurement from several hours to as many minutes. As the spherical candle power of the light source is, after all, the true measure of its efficiency as an illuminant, this must be considered a marked step in advance.

"With reference to the second line of progress, it may be said that 'The Electrical Testing Laboratories,' in New York city, are issuing standardized incandescent lamps that yield a candle power in close accordance with the Reichs-Anstalt standards, which are accepted as the most reliable in existence.

"The situation as regards a primary standard of light remains unchanged, but pending the development of a satisfactory primary standard of light we are able to maintain, thanks to the National Bureau of Standards at Washington and the New York laboratories above referred to, a working standard of light that will have all necessary constancy and ease of reproduction."

Gas Distribution.—The past year has witnessed an increased use of high pressure gas distribution, which seems to be coming into general favor. No noteworthy improvements, however, have been made in the appliances used in this system of distribution. One company has devised a very simple but effective high pressure street lamp regulator. In a large Eastern city bell-and-spigot cast iron pipe is being laid for the transmission of gas at 10 pounds pressure, the pipe being tested at 20 pounds. In a large city in the middle-West, gas is being distributed through 3 different systems of piping, each at a different pressure, the suburbs being supplied with very high pressure gas through small wrought iron mains, the extremes of the low pressure system being reinforced by special cast iron feeders from the works, carrying gas at 5 pounds pressure, automatic reducing pressure governors being used where these systems connect into each other. In Greeley, Col., a novel high pressure system of both manufacture and distribution is in experimental operation. The gas is of about 100-candle power when made, and is then pumped into a tank at 120 pounds maximum pressure, whence it is passed into the distributing holder which automatically injects sufficient air into the gas to dilute it to 20-candle power before it passes on to the consumers through 10 miles of small distributing mains.

Meters.—No improvements have been made in gas meters during the past year beyond those pertaining to factory details, except some minor improvements in the drums of station meters. A patent was taken out in England on an improvement in the rotary meter brought out a year or two ago. A well-known prepayment attachment has been improved by the addition of a device (furnished only when ordered) which is said to prevent attempts to "beat" it. The use of the prepayment attachment and of the prepayment meter is said to be increasing. The manufacturers of the straight-reading meter dial, referred to in last year's Progress Report, will be ready to make deliveries the latter part of this month. Ordinary meters equipped with these dials will cost 30 cents extra. A meter has been brought out in England that simultaneously records the quantity and pressure of the passing gas.

Incandescent Gas Lighting.—The following improvements and progress have been made during the past year in incandescent gas lighting and appliances:

1. Increased use of the yellow or mellow tinted mantle in place of the white.

2. Increased use of high grade mantles, and of mantles equipped with carriers.

3. Mantles are gradually being strengthened and hardened, making them less fragile and longer lived.

4. Adjustable gas checks of various makes are coming into more general use, conducing to better results under varying pressures.

5. Improvement in the materials of which chimneys are made, conducing to their more general use in place of the so-called "cylinder" chimneys which give lower efficiency.

6. Increased use of small mantles and burners, consuming half as much gas and giving half as much light as the ordinary sized mantle, and better adapted to domestic and decorative lighting, also producing less heat and discoloration.

7. Center pilot-jet by-pass, which produces a flame less likely to be blown out than with the older form, burns an extremely small quantity of gas, and automatically turns low while the mantle is burning full.

8. Developments of large units burning 6 to 12 feet of gas, specially constructed for use with airhole chimneys, the shades being supported by side rods independently of the chimney. The airholes in the chimneys throw the surrounding air directly upon the mantle, permitting the consumption of more gas, producing a larger light, but with a sacrifice of efficiency.

9. Improvements in outdoor lamps, as follows:

Ball-and-socket joint, that serves as an anti-vibration device, decreasing the breakage of mantles, and greatly facilitating the hanging and trimming of the lamp. Arrangement for protecting mantles while trimming. Means for easily renewing 1 mantle without exposing the other 3. Easy means for cleaning feed pipe and globe. Arrangement for hanging globe on supports while trimming lamp. Device for preventing wind from producing down draughts through the lamp. Air ports of Bunsen tubes protected by gauze, thus preventing the flashing back of the flame. Easy removal of globe without the removal of the globe holder. A guard for protecting the mantles from breakage by the removal of the globe, or by wind. Drip cup for condensation.

10. A new adjustable burner, known as the Tirrill, made in New York.

11. The Lucas lamp, mentioned in last year's Progress Report, has been improved, and is now made in units as large as 1,000-candle power.

12. The invention of the "Miilennium" high pressure and high candle power lamp, made in very large units, and now introduced considerably for lighting streets in Germany, with very promising success. The larger sizes consume as much as 42 feet of gas per hour, yielding 1,315-candle power.

13. The invention of the "Taj" burners, running as high as 1,000-candle power.

14. The improvement of the Plaisetty mantle, which promises much for toughness, durability and high candle power.

15. The d'Heureuse mantle, which is woven instead of knitted, resulting in greater strength and increased ability to withstand shocks, and minimizing shrinkage.

16. The development of the Scott-Snell lamp for street lighting, the water chamber being discarded, and the lamp being otherwise improved. This system is being tried in several English cities with promising results.

17. The increase in the adoption of the inspection and maintenance system of looking after mantles and burners by gas companies. The South Metropolitan Company, of London, now has a force of about 70 men engaged at this work.

18. The development of the Keith system of intensified incandescent gas lighting, which also is being introduced in England.

19. The development and improvement of various other makes of high candle power lamps.

20. A system of lighting and extinguishing gas street lamps by raising and lowering the gas pressure has been perfected in England, which has thus far successfully withstood practical tests.

21. Better means for regulation of both gas and air supplies to high candle power lamps.

22. An improvement and cheapening of the mantle which is so made as to automatically light the gas when it is turned on.

23. Inverted incandescent mantle burners have been perfected to a commercial success, permitting decorative effects and producing no shadows. These lamps are about to be pushed in this country.

There seems to have been no improvement or progress in this country in incandescent gas street lamps or burners, or in incandescent gas street lighting. In Europe, however, street lighting by gas is making rapid headway.

Mica Chimneys and Canopies.—Mica chimneys have been improved during the year by so making them that air is drawn in at the base either through perforations near the base or through an open space between the chimney and an inner collar, thus making them adapted to the use of large mantles requiring additional air supply, and they have become somewhat popular. A combined chimney and canopy is also being made of mica for small lights.

Holophane Globes.—Holophane globes were made in greater variety last year than ever, and the finish of the glassware is being improved. Their popularity continues to increase, the manufacturers claiming a gain in sales of 50 per cent. over those of the preceding year.

Gas Ranges.—The following progress in gas ranges can be recorded for the year:

The invention and perfecting of a split top burner that is said to prevent the flame from "wavering" or producing an odor, and which is easily cleaned and cannot leak at the joint.

Valves that are quickly adjustable by the operator to varying gas pressures, and so made as to keep the orifices free from foreign substances.

One concern has patented a broiling and roasting screen that slides in immediately under the oven burners and protects the foods from burning, and from the smudge and dirt due to dripping, fat, etc.

Two concerns have found it best to so change their ranges as to admit of sweeping underneath them, and one of them has devised a drop-oven shelf for the upper oven. Another has improved its oven bottoms, broilers and drip-pans, and has substituted steel panels for cast iron in the drop-doors. It is also using refined instead of japanned iron for the bodies, and to fill a certain demand is also making a plain range, devoid of all ornamentation. Ranges with elevated ovens and broilers are coming into more general use. There seems to be no diminution in the number of gas ranges manufactured yearly, and at least 2 additional factories have been put into operation during the past year.

Gas Water Heaters.—There has been brought out and put upon the market during the year a departure in the shape of an all-copper gas water heater in which the gas flame and products of combustion pass through the tubes on the same plan as the steam automobile boiler, instead of the water passing through the tubes as in the ordinary construction. The entire heater is without any casing of any description. The makers are of the opinion that copper or brass are the only materials of which water heaters should be constructed. Another concern has improved its heaters by making the castings thinner. Water heaters are coming into more general use, and additional factories are taking up their manufacture.

Gas Heaters.—One concern has placed upon the market during the past year what it calls "an odorless and base-heating gas stove," in which the burner is overhung with a firebrick cone that is said to make this form of heater give out a larger proportion of the heat in the form of radiant heat than is done in any other gas heater.

Gas Engines.—As was the case during 1902, the greatest progress in the gas business during the past year has been in the use and construction of gas engines. The following table, showing the number of engines, of 1,000-horse power or over, manufactured or contracted for by 5 of the great firms of Continental Europe, gives an idea of the rate at which the use of gas engines is increasing:

Year.	No. of Engines.	Total H. P.	Year.	No. of Engines.	Total H. P.
1900	2	2,000	1903	11	13,100
1901	2	2,000	1904	62[1]	90,000
1902	9	11,400			

Of this list, 8 are run on producer gas (7 specified as Mond gas), 2 on coke oven gas, and the balance on blast furnace gas. The Lackawanna Steel Company, at Buffalo, are now installing nine 1,000-horse-power gas engines.

Although none of these very large units are used with ordinary illuminating gas, yet the use of small units for illuminating gas is also increasing rapidly. It is stated that 50,000 gas engines of one comparatively recent make are now in use, and it is also said that there are now more gas engines being made than steam engines. There has been considerable development in the horizontal, double-acting engines of the twin-tandem, double-crank design. A considerable number of the latter are being installed for direct connection to alternating current generators to operate in parallel, which indicates the degree of refinement that has been reached in the matter of regulation. A firm in this country is prepared to build 4,000-horse power gas engines of this type. One gas engine expert reports that the most significant improvement of the past year is the rapid advance in favor of the 2-cycle engine which is now receiving great attention, especially in Germany. As to improvements in detail, one concern has adopted a solid cylinder head which prevents the possibility of water leaking from the water jacket into the explosion chamber. The cap which covers the cylinder head

1. Contracted for.

is also made thin and shell-like, so that if water carelessly left in the jacket should freeze, the jacket head will burst, thus avoiding damage to the cylinder proper. An auxiliary exhaust has been added, also the strap style of connecting rod, which is less liable to break than other forms and which lends itself to the easy taking up of the wear of the boxes. One engine builder predicts that the 2-cylinder vertical engine will cut quite a figure in the use of artificial gas, because they are adapted for use in buildings in densely populated portions of cities where gasoline engines would be prohibited. Considerable attention has been given during the past year to problems relating to the cooling of gas engine cylinders. Compound gas engines have also been tried during the year, but without flattering success thus far. There seems to have been no larger sizes of gas engines made in 1903 than were made in 1902. One engine building firm in this country is now building a 1,300-horse power gas engine.

The current year promises many interesting developments in gas engines, as inventors and experts are busy upon improvements and new types. An experimental engine has been built by one concern, a trial of which indicates that when perfected it will have a thermal efficiency of 45 to 50 per cent.

Many experimenters are working upon the gas turbine, and there are rumors that the problem of a successful gas turbine has been solved, although there is nothing more definite to report as yet. It is said that the General Electric Company is now making extensive experiments with this form of motor.

Electrolysis.—No progress worth mentioning has been made during the year, either in the development of means for the prevention of electrolysis of gas pipes, or by the courts in fixing the responsibility for damages from such electrolysis as between the gas companies and the electric street railway companies. The manufacturer of a well-known coupling recommends it for the prevention of electrolysis of service pipes.

Acetylene Lighting.—That acetylene lighting is making progress is shown by the following figures, which give the number of acetylene town plants installed in the United States in the past 6 years:

Year.	Number.
1898	4
1899	4
1900	10
1901	21
1902	21
1903	62
Total to date	122

It will be observed that more towns were thus equipped during the past year than during the preceding 5 years. There seems to be little field for acetylene lighting, however, in cities and towns supplied with ordinary coal or water gas.

A system of storage by absorption has been devised that increases the adaptability of acetylene for lighting cars, boats, etc. Forty steamboats in this country were equipped for acetylene lighting last year. The following railroads, among others, are experimenting extensively with acetylene coach lighting, all having a number of cars equipped with this system: New York Central and Hudson River, New York, New Haven and Hartford, New York and Harlem, Erie Railroad, Delaware, Lackawanna and Western, Chicago, Burlington and Quincy, Chicago, Rock Island and Pacific, Atchison, Topeka and Santa Fe, Delaware and Hudson, New York, Ontario and Western.

The Delaware, Lackawanna and Western now have 27 cars equipped for acetylene lighting, and are preparing to erect their own charging plant for lighting all of their coaches and stations with acetylene. The New York Central have an entire train lighted with acetylene, and the New York, New Haven and Hartford are now equipping 30 of their cars for acetylene lighting.

Some Odds and Ends of the Past Year.—The Fall River, Mass., and the Charlotte, N. C., Gas Companies have steam turbine blowers in their water gas plants.

The Milwaukee Gas Light Company have an emergency stopbox for hollow sidewalks that is giving great satisfaction.

The Pawtucket, R. I., Gas Company employs a Westinghouse pump for scurfing retorts.

The Burlington, Vt., Gas Company uses a Barnum respirator with much satisfaction.

A new form of saw has been put into use during the year for sawing the slots in lava tips, resulting in greater accuracy and smoothness of the slots.

The cloth strainers between the check and the tip of a well-known check burner are now being held in position by steel rings instead of cement.

The American Radiator Company, of Chicago, are making steam and hot water house heating boilers especially adapted for the use of gas coke.

Oval way gas cocks are now being manufactured.

Cast iron pipes are now being so made as to fit a well-known make of pipe couplings.

A well-known gas main stopper has been improved by the use of a more perfect spring.

One large gas company is discussing the advisability of purchasing coal lands for its own supply of gas coal.

Coal gas is being used for lighting the coaches of the Western Railway of France.

A machine has been brought out that very quickly removes broken taps.

A British patent has been granted for a turbine to be operated by the exhaust from an internal combustion engine.

A patent has been applied for in this country on a pneumatic device for firing bench furnaces with pulverized coal or coke.

A service pipe thawing machine has been recently patented and put into use.

A device has been developed and successfully tried, on a working scale, for automatically weighing coal charges into inclined retorts instead of measuring them.

Gas engines operating pumps are now used at the Philadelphia water works for increasing the water pressure in the mains at times of fires.

[Editor Butterworth concluded his report by giving the names of 192 persons or firms who gave him valuable information and aid respecting its compiling.]

Discussion.

At the conclusion of the reading of the Progress Department Report, the Editor was greeted by round after round of applause.

The President—Mr. Butterworth has certainly given us a most admirable presentation of progress in the gas business. We would be glad to have comments or inquiries. It is so thorough and comprehensive, however, that it really leaves nothing else to be said.

Mr. Butterworth—Mr. President, with your permission I would like to read a letter I received just before leaving Detroit, referring to gas engines, if I may, and let it become a portion of our proceedings. It is from a manufacturer of large gas engines referred to in my report, and is as follows:

"The past year has been remarkable in that it witnessed the greatest interest that ever has been manifested concerning internal combustion engines. Engineers from one end of the country to the other have communicated with us concerning gas engines in very large units for power stations, and we feel that the consensus of opinion among experts to-day is that the large unit gas engine is at last an assured fact. We ourselves have not done very much in actual gas engine construction during the past year, but we might say that the greatest progress which we have made in the development of the gas engine and its details has been made during the past year. In this time we have completed the two 4,500-horse power gas engines which we had under construction, and the erection in the plant in which they are to operate in West Virginia is now so well advanced that we expect both of these engines to be in service within the next 4 weeks. These two engines are the largest in the world by a very large margin, the largest that we know of outside of these being 2,500-horse power, so that these two engines of ours are almost twice as big as anything yet built, under construction, or contemplated.

"We are at the present time building four 1,000-horse power machines of this same type which are to be in service this coming summer.

"During the past year our company have felt so well satisfied with development of the gas engine. as carried on by us, that they have decided to go very extensively into the building of gas engines for all purposes, but in large units only, since we do not care to manufacture small units which are now built under very heavy competition.

"We have demonstrated during the past year the ability of gas engines in large units to convert into delivered work from 30 per cent. to 40 per cent. of the heat energy contained in the gas consumed. This represents an efficiency 2 to 3 times as good as the very highest grade steam engines in the country, and certainly promises much for the gas engine as the prime mover of the 20th century.

"Five years ago we appreciated the fact that the steam engine had

reached its highest state of economical development, and that some other prime motor would surely supersede it in the 20th Century. We investigated the matter carefully at that time and made up our minds that the only prime motor which could do it would be the internal combustion engine, and we accordingly made arrangements to manufacture a number of these under the Klein patents with a view of getting sufficient information to enable us to start on the development of the gas engine along American power engine lines instead of along foreign lines, as is being done by others. We have been very successful in this, and very shortly we will bring out a line of gas engines strictly American, moulded after American power engines, which development has been a steady, healthy growth during the 19th Century and cannot well be set aside or overlooked when considering a prime motor of the future.

"There is no proposition in connection with gas engines in large units which has not been satisfactorily solved, and the next 2 years we believe that a large number of very large engines driving alternators direct connected will be installed."

Mr. Stone—This report shows the immense amount of work which Mr. Butterworth has done in collecting the facts therein set forth. It is so comprehensive, however, that we will all have to take it home and study it in order to fully appreciate its scope and merit. I therefore move a hearty vote of thanks to Mr. Butterworth for his most excellent report. [Adopted.]

The President—Before we adjourn, we will call upon Mr. F. W. Stone to outline his work in connection with

THE REPORT OF THE BUREAU OF FORMS AND RECORDS,

which was submitted verbally as follows:

It has been suggested if the various gas companies were to see how each other kept accounts and their methods of doing business with the various forms used, it would be of great help in formulating some uniform method of keeping accounts. That is, we would get closer together by the use of some one uniform method of keeping our accounts than we could in any other way. We look over some other company's way of doing the work and thinking that way was a good one we would adopt the best part of the method trying to adapt it to our particular way of doing business. Feeling that this would be a benefit to all the members of the Association I was asked to take up the work of collecting samples of the different forms and different records used by the various gas companies in keeping their accounts. I wrote to a number of the companies and I got responses, I think, from about 60 of them. Some of them sent me samples of all the forms that they use; others sent samples of what they considered the best, and there has been some work expended in connection with the classification and indexing of these various forms. I only had a short time to do it in. The work has not been altogether satisfactory to me and it is not as complete as I would like to have it. The forms I have collected will be found in these books which you see lying here. There is no use in trying to read them, or to make an exhibition of them individually at this time. I imagine the best way to do it would be to leave them on the platform so that any one interested in the work can come and examine them as he wishes and when he wishes. For instance, if anyone is interested in getting out a new customer's register and wants to see how other companies keep one he can find samples from other companies in these books. Or if you want a new meter log book, or to know how other companies keep track of labor account, or the form that is used for the contracts for fuel gas appliances, or anything of that kind, we have samples of all of that work here. We have at least one sample, I think, of almost any form that a gas company would require. I do not imagine the record is in any ways complete, but it is as complete as I have been able to make it in the time I had to devote to it. I would suggest that the work be kept up because each one of us, I think, can improve on what we now have. Each one of us can get up a better form next year than this year, and each one of us will perhaps make some change in his method of bookkeeping. I, therefore, suggest that the work be continued, and that all of the members furnish the bureau as much information as they can. Forty, or 50, or 60 gas companies do not represent by any means the number of gas companies, officers of which are connected with this Association. If everyone was to respond it would help us a great deal. You may think that you have some form peculiar to some special purpose, or some special condition peculiar to your own company and you may think nobody else would be interested in it. Yet somebody else might be doing business under just exactly the same conditions, and we want the forms you are using and which would enable him to keep his accounts under just the same conditions you are keeping yours, and he would be glad to look over what you have even though he might not adopt the method employed by you. It would give him an idea perhaps how he could change or modify the forms submitted to suit his own peculiar condition. I believe that is all I have to say, Mr. Prestdent. The books are here. Those who want to look at them are at liberty to do so. If you want to look up some particular department you will find an index in the front of each one of the books and the different forms used in that department are classified so that you can find them without much difficulty, I trust. I tried to arrange them at any rate so that you would have no difficulty in finding just what you wanted.

The President—Mr. Stone has certainly done a great deal of work in collecting these forms and records, and any member wishing to avail himself of the forms and records submitted, can do so. They will be here upon the platform accessible to all members throughout the rest of the meetings. I do not know what provision has been made for furnishing information during the year, but I should imagine if any of the members at any time during the year after this meeting has adjourned desired information as to particular forms and records, by writing to Mr. Stone he could furnish them with sample slips which could be returned again; or even the whole book could be furnished, the understanding being that it would be returned as promptly as possible.

Mr. Stone—I think I have indicated on each one of the forms, or each one of the leaves in the different books, the gas company the particular form came from, and I suggest in looking over the forms if you see something which you think is good and you want to talk to the representative of the gas company about it you can look him up and ask him how he likes it, or how it works, and all that sort of thing. In that way, perhaps, you will get better acquainted with the forms and the way in which they are used than by asking me to furnish you the information. If I possessed the information I would be only too glad to furnish it, but many of these forms have simply been submitted to me to form a part of the forms collected, and I know but little personally about the workings of the various forms sent in. I might not be able to explain how the particular gas company keeps a particular account with which I am not familiar, and it would be much better for anyone desiring information to see the representative of the gas company furnishing the form and getting the information in that way. I would be glad to help all that I can, of course.

On motion, a vote of thanks was extended to Mr. Stone for the work expended and the results submitted on behalf of the Bureau of Forms and Records.

The President—We will not take up any further papers this afternoon. I would announce, however, that to-morrow morning we will have a paper by Mr. Baehr on "Construction and Operation of Recuperative Benches," also "Novelty Advertising and New Business Methods Departments," as edited by Mr. Perkins. We will also be able to take up some of the reports of the various committees, including the report of the Committee on Meters. The Question Box will be to-morrow afternoon, To-night there will be a Smoker held in this room at 8:30, a courtesy extended to the members by the Local Committee on Entertainment. As the members go out from the hall this afternoon they will find theater tickets outside the door for to-morrow evening, which are also furnished through the courtesy of the Local Entertainment Committee.

On motion, the meeting was declared adjourned until 9:30 A.M. of the following day.

(To be Continued.)

A Review of the Last Report of the Massachusetts Board of Gas and Electric Light Commissioners.

The 19th Annual Report of the Massachusetts Board of Gas and Electric Light Commissioners, for the year ending June 30, 1903, has recently come to hand, and, like its predecessors, is full of the most interesting and authentic information relating to the gas and electric business of that State.

The liberality and public spirit shown by the State in forwarding this publication (which now forms a volume of 408 pages) entirely free of expense to any person interested in its subject matter, cannot be too highly commended.

The book is so full of valuable statistics that it is difficult to make a detailed review of it, and as it is accessible to everyone interested, we recommend its careful perusal, not only of the printed matter, but also between the lines, as much information may be extracted that is not given in special tabular form. We shall, therefore, confine this notice

o a review of its more important features, and to some criticisms, which we hope will be accepted in the spirit in which they are ma de.

The Commission now has under its supervision 163 undertakings, being the same total number as last year, but one more plant has become municipal, making 18 in all. Of these undertakings, 48 supply gas only, 29 supply gas and electricity, and 86 supply electricity only. Six new electric charters were granted during the year, and one new gas charter to the Worcester County Gas Company.

During the year several small electric companies either consolidated with or bought current from other companies, and went out of the busi_ ness of manufacturing electricity. One small gas company (Williamstown) gave up manufacturing oil gas and buys its supply from North Adams. The Blackstone Electric Light Company buys its current outside the State of Massachusetts, from the Woonsocket Electric Light and Power Company. Twenty-nine tests of electric meters were made during the year, which gave readings (at various loads, from 25 per cent. up) of 27 per cent. slow to 17 per cent. fast. There were 42,518 gas meters tested, of which 1,200 were old meters in use and the remainder new or repaired meters. Of the 1,200 old meters, 5, or practically 6, would not move; of the remainder—

535	were correct (*i. e.*, within 2 per cent. each way).				
390	"	between 2 and 5 per cent.		fast.	
136	"	"	5 and 10	"	"
13	"	"	10 and 15	"	"
2	"	"	15 and 20	"	"
78	"	"	2 and 5	"	slow.
29	"	"	5 and 10	"	"
4	"	"	10 and 15	"	"
1	was	"	15 and 20	"	"

And the 6 others were to the disadvantage of the companies in a greater degree. The number of electrical meters tested was not large enough to make a comparison with the gas meters of their relative accuracy, and it is not stated whether they had all been in use or not. Only 33 per cent. of them were correct, within 2 per cent., as compared with 44.6 per cent. of the gas meters.

The average error of the 1,195 gas meters that moved at all was 1.28 per cent. fast. Fees for testing gas meters are 25 cents up to and including 5-light, 30 cents to 60-light, 50 cents to 100-light, etc. Legal standard for light is 16 candles, and for purity no sulphuretted hydrogen, and not exceeding 20 grains of sulphur in other forms, and 10 grains of ammonia, per 100 cubic feet. Tests of candle power of some of the principal companies showed averages and minima, as follows: Bostou Gas Company, 19.1 and 17.3; Brookline, 18.8 and 16.2; Cambridge, 18.3 and 16.2; Fall River, 20.6 and 18.2; Lowell, 18.3 and 15.4; Worcester, 19.5 and 18.2. Thirty-seven companies at times, tested below the legal standard. Of these, Stoneham, a small company making gas from bituminous coal and oil, by the Davis "Improved" process, gave only a maximum of 7.4 candles and a minimum of 4.7. What this process yielded before being "improved" is hard to imagine. The averages of 15 companies were below the legal standard, but what action, if any, was taken by the Commissioners in these cases is not stated. The highest average of any of the larger companies was South Boston, with 22.33 candles, though this was slightly exceeded by the small company at Ipswich, making a naphtha gas by a process using over 10 gallons per 1,000 feet, and yielding 23.85 candles.

Of the five small companies making a direct oil gas, the illuminating power varied from 24 to 50 candles. There were many cases of excess of sulphur, the highest being 32.4 grains at Lowell, in addition to 20 companies showing sulphuretted hydrogen in the gas. Nine companies showed excess of ammonia, the highest being Greenfield with 30 grains. It is stated very clearly that these are the "excess" quantities of sulphur and ammonia, which would make the total quantities 54.4 and 40 grains respectively, exclusive of sulphuretted hydrogen, and would form a rather "strong" combination. In the eudiometric analyses, the percentage of illuminants present seems in many cases rather high, compared with the candle power. One test at Fall River gives 13.88 per cent. illuminants for 20.2-candle power. The highest percentage of carbonic oxide present is 31.23, and is also at Fall River.

The highest and lowest percentages of carbonic acid are 4.49 and .42 at Boston, but it would be unfair to Stoneham to omit to state that it leads all, with 7.88 per cent.

It should be stated that this company is now operating under a special license for 1 year, from the Commissioners to make and sell gas for $1 per 1,000 feet of not less than 6-candle power.

The percentage number of gas companies showing deficiency in candle power, as compared with 1899, is increasing rapidly, and where in that year there were only 7½ per cent., there are now 52 per cent. The average candle power has also decreased in the same time, 1.78 candles for the coal gas companies, 2.82 candles for the water gas companies, and 1.26 for the mixed coal and water gas companies. The percentage number showing sulphuretted hydrogen and excess of sulphur has increased, while the ammonia percentage has decreased. The average candle power of the oil gas companies has decreased 8½ candles.

For sound common sense and a perfect grasp and understanding of the questions involved we commend the reading of the decision of the Commission (p. 22), refusing permission to an opposition electric light company to engage in business in Haverhill, and also the answer to the petition of the customers of the Marlborough Gas Light Company, p 25.

Twenty-nine gas and electric companies applied for permission to issue new stock and bonds, and all were granted, in whole or in part, to the amount of $3,770,200, of which about $2,760,000 was for electric extensions or purchases of other companies. Of this amount, the Edison Company, of Boston, received $2,000,000.

Very many cases of violation of the law are reported, 11 of them being in the simple matter of the companies making their returns within the prescribed time, which is more than ample for the purpose. This has been a trouble since the earliest days of the Commission, and 15 years ago the Commissioners recommended that they be empowered to impose a penalty for the delay. This authority was subsequently granted them, except in the case of the municipal companies, but the penalty does not appear to be adequate, as both classes of companies are almost equally delinquent. The result of this negligence is, that in addition to the annoyance to the Commission, the reports are not published for 9 months after the close of the year to which they refer.

Six pages of the report are devoted to statistics of the attitude of various towns and cities regarding municipal ownership. The city of Fall River, and the towns of Ipswich, Mansfield and Merrimac, decided last year to build their own municipal electric lighting plants. Eighteen small municipalities own their own lighting plants. Of these 14 are for electric lighting and 4 for gas and electricity. The largest of the latter class is Holyoke, with a population of 45,700, but it has only been operated on municipal account since December 15, 1902. Apparently the municipal companies enjoy an entire exemption from taxation. The operation of all the municipal gas plants, after charging interest and depreciation, showed a profit of $3,615 in 1902, and $10,697 in 1903.

The aggregate results of the operations of the municipal electric companies showed a net loss of $154,996 in 1902, and $209,203 in 1903. These losses included the cost of the street lighting, which generally averages about 66 cents per inhabitant, and would, on the aggregate population, amount to $130,000, so there must have been some actual loss in operation. The Commissioners estimate this loss at about $95,000, which includes about $62,000 depreciation.

It is of interest to note that the city of Holyoke sold its $720,000 of 3½ per cent. bonds in payment for its municipal plant, at 1 4/8 per cent. premium, though the bonds are not very desirable, as $24,000 of them are called yearly.

The total gas made in all the municipal plants (except Holyoke) was 36 million feet during the year, and Holyoke made 59½ million in the 6½ months in which the works were run by the city. The oldest municipal plant is at Middleborough, which was acquired by the town in 1893.

The gross receipts of all the gas companies were $9,543,000, and in 1902, $7,968,000, and they showed a surplus, after paying interests and dividends, of $735,476 last year and $703,073 in 1902. Two of the companies did not earn expenses, and 26 did not earn enough to pay any dividend. In 1902 these figures were 5 and 17.

This increase, from 22 to 28, in the number of companies paying no dividends, is principally accounted for by the stoppage of dividends in 1903 of the Boston, Bay State, Roxbury and South Boston companies from litigation and complications incidental to the foreclosure of the "Boston United Gas Bonds."

The Haverhill Company, which is the largest of the other companies, and is owned principally by one interest, has paid no dividend since 1900, though it has a balance of $129,000 to credit of P. & L., with a total capital of only $75,000 of stock. The profits of 1903 were nearly $22,000. There is something radically wrong with the operation, or with the statement of this company, as it should be making a profit of upwards of $60,000 per year.

The process of manufacture in these works required the use of naphtha, the price of which was raised about 100 per cent. in the fall

of 1902, and to this increased cost is no doubt largely due the small amount of profits realized. This company has the smallest capital per 1,000 cubic feet sold of any company in the United States, if not in the world. It amounts to only 54 cents and the company could, if it chose, pay a dividend of 10 per cent. on its capital of $75,000 from a profit of only 5 cents per 1,000 cubic feet. Its assets, as shown by the books, are $488,000. Its total capital stock was sold 4 years ago for about $500,000.

Most of the other companies are very small, and few of them exceed 10 million cubic feet of sales per year. Five of the companies which declared no dividends, reduced prices during the year. Total taxes were $446,673; and in 1902, $412,408. Taxes per 1,000 cubic feet of gas sold, vary from ¼ cent to 69 cents, and average 4.3 cents. The tax of 69 cents is on an acetylene gas plant. The total amount of taxes increased about $29,000 over 1902, but owing to increased sales the tax per 1,000 cubic feet was reduced $\frac{4}{10}$ cent.

There appears to be a discrepancy of about $5,400 in the amount of taxes paid in 1903, as stated on pages 112 and 116, due, we believe, to the taxes on the electrical departments of these companies having been included, on page 112.

The total assets of all the gas companies (including their $4,430,000 of electric assets) were $41,990,000, and surplus over all liabilities, $9,748,000. Adding reserve fund to this makes the actual surplus $10,662,000.

Three small acetylene plants are under the supervision of the Commissioners. Excluding these, and also the direct oil gas plants, the highest average price paid by the consumers is $2.11 per 1,000 cubic feet at Marblehead, and the lowest, 90.9 cents, at Lowell.

The largest dividend paid per 1,000 cubic feet of gas sold is 58¼ cents by the Milford Company, on sales of only 12 million cubic feet per year. Excluding the Boston Companies, the larger companies of the State pay dividends varying from 16 to 26 cents per 1,000 cubic feet.

The total number of meters in use in the State is 263,792, which being divided into the sales shows an average per meter of 27,500 feet per year. The greatest sales per mile of main were nearly 9 million cubic feet, and greatest number of consumers 210 per mile, both by the Boston Company. The average price paid by consumers in various years, up to 1903, was: 1886, $1.72; 1890, $1.46; 1895, $1.21; 1900, $1.10; 1901, $1.08; 1902, $1.07, and 1903, $1.06 per 1,000 cubic feet. This does not include gas made direct from oil, the average price of which is $4.62 per 1,000 cubic feet.

The total sales of gas in 1903 were 7,236 million cubic feet, and in 1902, 5,947 million cubic feet, showing an increase of nearly 22 per cent. Unaccounted-for gas was 6½ per cent. The total volume of gas unaccounted-for was 486,561,000 cubic feet, and as the total mileage of mains was about 2,665, the unaccounted-for gas per mile was 182,000 cubic feet per year, which is below the average. The sales average 2,720,000 feet per mile. The population of Massachusetts is now about 3 millions, and the sales per head are, therefore, 2,400 feet per year. The population is equal to $\frac{1}{29}$ of the whole population of the United States, and though it is difficult to get accurate gas statistics of the other States, the Massachusetts sales are probably about $\frac{1}{15}$ of the total sales of the country, and less than ¼ of those of Greater New York.

The above figures do not include the sales of the municipal plants, which are 89½ millions of feet, or about 1¼ per cent. of total sales.

[To be Concluded.]

Electric Generating Stations.

On Monday, March 28, before the Royal Institute of British Architects, Mr. Stanley Peach read an interesting paper dealing with electric generating stations, principally from the architect's point of view.

Twenty years ago, power stations as we know them to-day were non-existent, and it is within the last 15 years that the evolution of the enormous structures devoted to the supply of electric power has been accomplished. Foreign countries took the lead in this development, and they still hold the first position as regards central stations of size and importance, so that we, in this country, may, to some extent, follow their lead in construction, of course, avoiding their errors by the light of the experience since gained. The buildings which come within the scope of this paper fall roughly into three classes—power stations, substations, and direct supply stations, the latter being either simple or composite.

The nature of the initial source of power must exert a preponderating influence on the design of the power station. As far as this country is concerned, water power stations may be neglected, though abroad they are important in size and number. Illustrations of the plant and buildings at Chèvres, Niagara, Tivoli, Geneva, Rheinfelden, etc., were projected on the screen, and Mr. Peach pointed out the principal architectural features of each in turn. The Continental stations were particularly noticeable for the harmony of the design with the surroundings, whether buildings or landscape. The construction of steam power stations was more complicated than in the case of water power stations, as provision had to be made for boilers, coal storage, etc. A large number of steam power stations were shown on the screen, including all the most notable examples of European and American practice. Many fine chimneys were also shown to illustrate various ways of ornamentation and construction, the chimney of the Munich Corporation causing considerable amusement by the extent to which the designer had carried the craze for ornamentation. The arrangement of the large modern American stations was almost identical with that proposed by Mr. Ferranti for Deptford so many years ago, and Mr. Ferranti's extraordinary prescience might be realized by a comparison between that gentleman's original drawings, which were framed on the wall, and a drawing of the Manhattan Station which hung beside it. The chimney shafts of the American stations were now frequently made of steel, standing on a brick pedestal of about the same height as the buildings. As this type of construction was likely to become common in this country, the author gave the following data of the chimneys of the Waterside Power Station, New York: The brick pedestal is 80 feet high, and above it there are 3 lengths of steel sheet, each 44 feet long and ⅝-inch, ½-inch, and ⅜-inch thick respectively. The joints of the shell plates are riveted, and internal angle irons carry the brickwork lining. This is of firebrick for about three-eighths of the height, and then of good ordinary brick, an air space of about 4 inches being left between it and the shell. Serious trouble may occur owing to the expansion of the lining, which is about 6 inches in 100 feet. The headers may thus be snapped and the unsupported lining fall down.

In stations built as compactly as those in New York the question of foundations was of the utmost importance. The weight was distributed unsymmetrically over a very small area, and if the subsoil was wet or soft, even the use of piling or retaining walls could hardly be relied on. In England we were not limited to an area of the size of a city block as in America, and it was mistaken economy to cramp the dimensions too much. Illustrations of the stations at Philadelphia, Bristol, Chelsea, Grove Road, Berlin, Vienna, and many others were projected on the screen and commented upon by the author, who then turned to the question of sub-stations.

These, by their very nature, must be placed in the center of crowded localities, and formerly a vault under the street or a cellar was considered suitable for the purpose; but their importance is now better recognized, and more attention is paid to their design. The provision of moderately handsome buildings, even at a slightly increased expense, would often go a long way towards removing the objections of neighboring property owners and ingratiating the supply company with its prospective customers. The sub station at Bennett street, Manchester, was an excellent example of internal arrangement. The high and low tension switchboards were kept separate, but were placed on adjacent walls of the gallery, so that each was in full view of the engineer at the other, who also had an uninterrupted view of the whole of the running machinery beneath. The most satisfactory buildings for industrial purposes of any sort were those in the designing of which there had been a friendly co-operation between the architect and the engineer. The latter had to provide all the plant to be housed, and to see that it is arranged suitably for easy and economical working. He could not be expected to give the same minute attention to the building which is to contain it; that was the province of the architect, who, if he had an intelligent general knowledge of the functions of the plant, and kept in touch with the requirements of the engineer, would not fail to produce a suitable building.

The discussion was opened by Professor A. B. W. Kennedy, who said he was glad to see so many people present, and took it as a sign that the profession was becoming really interested in the question of suitable buildings for central stations. If architects would not take the matter seriously, then it would have to be done by the engineers, for it was a pressing question and could not be shelved. He thought that Mr. Peach had been too modest in his paper, for no one could have guessed from it that he had been professionally connected with many of the most perfect examples of central station architecture in this country. The question of the vibration set up by the running machinery was one of the most serious that engineers had to face. The foundations, of course, must be separate from the walls of the building, and should be

so designed as to have a long period of natural vibration. The shape of the foundations was very important, and their proportions should be more like those of a tile laid flatwise than, as usually, those of a brick set on edge. By suitably shaped foundations of sufficient area, all chance of rocking could be eliminated, and it was this rocking which was at the bottom of most of the trouble experienced. The interposition of sand below the concrete block would also have a beneficial effect, and Mr. Peach had succeeded in avoiding all vibration in the Central London Station by this method. Another point of importance in central station design was the absence of all combustible material, for however confident the engineer might be that no fire could originate in the station, there was always the chance of danger from a burning building in the neighborhood.

Colonel Eustace Balfour remarked that the absence of water power in this country involved the erection of chimneys which should constitute handsome and striking features of generating stations. Mr. Peach deserved much credit for the attention he had paid to the design of chimneys, and he might mention that Lord Wemyss had compared the first chimney of the Carnaby Street Station very favorably with the Campanile of St. Mark's, at Venice. He indorsed Mr. Peach's remarks about the necessity for close relationship between the engineer and the architect. This need for co-operation began in the early days of railways, and many famous stations bore evidence to the advantages to be gained from the mutual assistance of the two professions.

Mr. Slater called attention to the advantages of water power stations on the score of cleanliness, and maintained that whatever power was adopted, the best method was to have a large power station in some place where it did not interfere with the neighborhood; the small substations caused little annoyance, and could easily be made to harmonize with their surroundings. The vibration from a large power station was almost impossible to prevent. Vibrations, both of the earth and the air, were set up, and engineers did not seem to understand the matter; it was a common experience for a very unpleasant vibration to be felt a considerable distance away, although it could hardly be detected at points much nearer the running machinery.

Mr. S. Z. de Ferranti considered the paper most interesting and instructive to both engineers and architects. As a full and accurate record of the progress made in the design of central stations, it was a very valuable contribution. He would like to know how the difficulties of the expansion of the firebrick lining of steel chimneys could best be met, as it was a very important matter.

Mr. Arthur Wright called attention to the advantages of dividing risks in stations, so that the bursting of a steam pipe, for example, should not cause the shutting down of a whole station.

Mr. A. Gay said that, as regards vibration, there had been no difficulty whatever at Islington. The foundations of the buildings were taken below those of the engines, and were made wide at the bottom. There had been a slight vibration due to some pumps which were situated adjacent to a church, but it was found to be due to the suction pipe having been imbedded in one of the walls of the building. The addition of an air vessel at once stopped the annoyance. At another time the church authorities had complained of the air concussion caused by the exhaust from an engine, but the turning of the exhaust into the chimney-stack removed the cause of complaint.

The author, in reply, thanked those present for the kind reception of the paper. The question of vibration was a very large subject. Aerial concussion from exhaust steam could be avoided by exhausting into a silencing chamber or carrying the outlet higher up. Other vibrations could be minimized by paying attention to the foundations, and seeing that they were sufficiently large and wide at the base. The foundations should bear on their edges, as the tendency to rock is then minimized. Chambering the foundation block is a good way of insuring that the full width of the base is efficient. As regards the expansion of the brick lining, sufficient space must be left above it to allow the elongation to take place. The largest amount he had ever measured was 9 inches in 100 feet; and there was no doubt in the case because the chimney had been cooled down for repairs, and the position of the lining when heated was clearly visible.

A Few Notes on the Steam Turbine.

[From a paper read by Hon. G. L. Parsons, at the Newcastle Meeting of the English Institution of Electrical Engineers.]

The early turbines were governed by a lantern type of throttle valve worked by the movement of a leather diaphragm, which the suction of a fan on the shaft tended to close against a spring. The admission of air to the diaphragm was controlled by an electrical governor. On the top of the magnet yoke there was a small iron bar pivoted on a vertical spindle and carefully balanced. This was moved round by the alteration of the magnet yoke against a spiral spring. A double finger or arm was keyed on the same vertical spindle; the end of each finger was flat, and when opposite to the inlet of the air pipe, closed it. The spiral spring was so adjusted by a movable head that the greater the voltage the more was the air inlet closed by one of the fingers. When the inlet was open the air rushed along the pipe and partially neutralized the suction of the fan, allowed the diaphragm to extend, and thus opened the throttle valve. If the dynamo got demagnetized the needle turned the other way, and the safety finger closed the air inlet and thus cut off steam. This type of governor was very sensitive, and kept the voltage steady within 1 per cent. The steam consumption of a 32 kw. plant of this type running non-condensing was about 48 pounds per electrical horse power hour with a boiler pressure of 61 pounds, and about 42 pounds per electrical horse power hour with a boiler pressure of 92 pounds.

In 1899, owing to temporary loss of patents, the radial flow type of turbine had to be adopted. This consisted of a series of fixed annular disks with rings of blades, between which another series of disks keyed to a shaft rotated. The guide blades were secured to the faces of the stationary disks, and nearly touched the rotating disks, while the moving blades nearly touched the fixed disks. The steam passed outwards through the successive rings of blades, then inwards along the back of the first moving disk, and again outwards through the next ring of blades until it finally reached the exhaust. In 1892 this type of turbine was first tried condensing with a vacuum of 27 inches. With slightly superheated steam at a pressure of 100 pounds the consumption at the normal full load of 100 kilowatts, was 27 pounds per kilowatt hour.

In 1894, however, the parallel flow pipe was again adopted with considerable improvements. The turbine was made single-ended, with the steam passing in one direction only, the second series of rings being replaced by three rotating pistons, or dummies, by which the end pressure of the steam along the shaft was balanced. Each of the pistons corresponded in size to the part of the turbine it balanced, and to which it was connected by a pipe. Grooves were turned in these pistons, between which the corresponding fixed collars of the cylinder projected, and, being almost in contact, reduced the leakage of steam to less than 2 per cent.; the amount of clearance could also be regulated by the thrust bearing at the end of the turbine shaft.

The governor can be of the mechanical type, which keeps the speed constant, or of the electrical solenoid type, which maintains a constant pressure at the terminals of the dynamo by raising the speed of the turbine to meet the fall in voltage due to the increase of the load.

The electrical governor is now seldom fitted except on the smaller continuous current plants. A small pump supplies oil under pressure to all the bearings, the oil being then returned to the tank to be used over and over again, resulting in a great saving as compared with reciprocating engines. Inside the cylinder itself no lubrication is required, since no parts are touching; the two end packing glands being of similar construction to the balancing pistons, also run clear, hence no oil can possibly find its way into the exhaust. Turbines are running in breweries and chemical works, where the exhaust is led straight into the vats or liquids which require to be heated, and at Heaton part of the turbine exhaust steam is especially condensed to be used as distilled water for delicate chemical processes. The cost of oil for a large turbine works out at about 0.002d. per kilowatt hour. The single-cylinder type of turbine has again been adopted for the large as well as for the smaller sizes, being found cheaper as well as more efficient, besides requiring a shorter engine room. Plants up to 10,000 I.H.P. are now being constructed with a single cylinder. As a high vacuum is most important for obtaining the best results in steam economy, ample space is allowed at the end of the tuobine for the exhaust steam, and the condenser is generally placed in a pit straight under the turbine, so that the drop in vacuum may be as small as possible between the machine and the condenser, while the length of piping required is greatly reduced. The following table shows the effect of variation of vacuum on the consumption of steam in the case of a 1,500 kw. set. For the smaller sizes the variation is not so marked:

Vacuum Bar — 30 Inches.	Difference in Steam Consumption per 1 Inch of Vacuum.
29 inches	6 per cent.
28 "	5 "
27 "	4 "
26 "	3½ "
24 "	3 "
22 "	2½ "
16 "	2 "

As regards the cost of obtaining these high vacua, a little investigation will show that the extra power required to maintain a higher vacuum in a given condenser (and the cooling surface need not be larger than usual) is very small in comparison with the saving of steam in the

main turbine with a good vacuum. Three sets of 300 kw. each have just been completed for the corporation of Derby. They run at 3,000 revolutions per minute, and are intended to supply current for traction and lighting. Curves were taken on a Horn tachograph showing the variation of speed when the main circuit was made and broken on a load of 350 kw. The temporary variation did not exceed 4½ per cent. and the permanent 2½ per cent. The dynamo was tested by throwing 350 kw. off and on when running both as a shunt machine and as a compound, no movement being found necessary for the brushes, which were of brass wire. The following table shows the variation of voltage under different conditions:

	Kilowatts.	Voltage.	Speed.
Compounding in use.....	0	505	3,075
" "	336	565	3,000
Shunt only.....	300	500	3,000
	0	543	3,075
	0	520	3,000
(Constant excitation)	0	518	3,000

Electricity and the Law in England and America.[1]

By Mr. W. Valentine Ball.

There is no subject which awakes a wider interest on both sides of the Atlantic than electricity. The extraordinary development of its varied uses in recent years, the facilities which it has afforded for locomotion and the transmission of messages, not to mention all the other multifarious needs of mankind which it serves, tend to give it the foremost place among those branches of modern science which have been found capable of practical application.

Seeing that the application of electricity on a commercial scale is of comparatively recent growth, it is not surprising that the law which affects its generation and distribution is to be found in statutes passed and cases decided within the last few years. But the search, even when conducted by a lawyer in England, should not be confined to English statutes and law reports. If exhaustive treatment is required or an argument is to be pointed by references to a decided case, he must often refer to the work of American lawyers, for numerous interesting cases upon the laws of electricity have from time to time been decided in the courts of the various States of the Union.

It is to be observed, however, at the outset, that although English and American lawyers have advanced along the same lines in ascertaining the application of legal principles to the vagaries of electricity, the decisions in the one country can only be regarded as useful precedents by lawyers in the other. Further, the decisions in the various States of the Union are by no means uniform, nor does it appear that the opinion of a judge in one State is binding upon that of his judicial brother in another State. Nevertheless, the general principles—with which it is my object to deal in the present article, may, broadly speaking, be taken to apply not only in England and America, but throughout the countries which are inhabited by English-speaking races.

In England, the manufacture and supply of electricity to consumers is an industry in which any private person may indulge without legal restriction, so long as he complies with the ordinary law relating to nuisance and negligence. In view, however, of the difficulties attendant upon the laying of wires and mains across private and public property, and the necessity of allowing electrical companies to have power to break up roads, etc., for this purpose, certain acts have been passed under the provisions of which the supply may be carried out under powers which impose upon each company the duty of supplying every consumer in its district on equal terms. Of these, an act passed in 1882, is the most important, and one of its provisions is worthy of particular attention—*e. g.*, Section 17, which provides that in the exercise of the powers in relation to the execution of works given them under the act, or any license, order or special act, the undertakers shall cause as little detriment and inconvenience and do as little damage as may be, and shall make full compensation to all bodies and persons interested for all damage sustained by them by reason or in consequence of the exercise of such powers, the amount and application of such compensation in case of difference to be determined by arbitration. This clause makes it plain that the company cannot plead their parliamentary powers in answer to an action for damage caused by them in the execution of their works.

Their liabilities are further declared by another provision which forms part and parcel of every order under which they work, and which provides that nothing shall exonerate electric lighting undertakers from any indictment, action or other proceedings for nuisance in the event of any nuisance being caused by them.

The effect of these sections is that they are subject to what is known in England as the common law. There is nothing which better illustrates the adaptability of the English law to the needs of the public than the way in which the legal questions incidental to the supply of electricity are found to be solved in so far as they are not dealt with in special statutes by the recognized principles underlying the leading cases decided by English judges in days gone by.

1. *Electrical World and Engineer.*

It is proposed to deal here with the liabilities of supply companies under the heads of (1) negligence and (2) nuisance.

There are many ways in which a supply company may be guilty of negligence. At the generating station iiself perpetual care has to be taken that the apparatus is in such order that employees shall not be exposed to unnecessary risk. Heavy machinery involves danger to those who are employed to work it, while men employed around dynamos and at a switchboard are constantly exposed to the risk of electric shocks. Accidents at generating stations give rise to claims for compensation under the Workmen's Compensation Act, 1897, and the other acts which render employers liable to pay damages for injuries which are caused by their negligence in permitting the use of defective machinery, or employing persons whose negligence occasions injury to their fellow servants. As questions of this kind are of common occurrence and are determined upon principles which apply to all actions for personal injuries, it is not necessary for our present purpose to discuss them further.

I pass on to consider the question of liability for accidents which may arise during the transmission of electricity. Dealing first with electric lighting companies, it is necessary to point out that for the purpose of their undertaking they usually require to lay their lines overhead or underground along public streets. The Electric Lighting Acts, subject to any special modifications which may be introduced in favor of any particular company, confer upon the undertakers the right to exercise the power, subject to their making compensation for any damage or injury which they may occasion to any property interfered with. In the case of overhead wires, attachments may have to be made to houses or private property along the roadway, or to posts erected on the street itself. Again, when wires are laid underground, it is often necessary for the lighting company who wish to lay their wires to remove temporarily water pipes or gas pipes which may be in their way. In all these cases the company is liable for negligence.

But the liability of the company does not end with construction of works. They are also bound to make good any damage which may be occasioned to the public by falling wires, escape of current and electric shock. If we may refer to a case which has to do with electric traction, in a suit which was heard some years ago, it was proved that a wire which was fully charged, fell upon and killed a horse. The Court held the company liable. But where, in another case, the damage was caused by a telephone wire falling on a trolley wire and so earthing the return current, it was held that inasmuch as the falling of the telephone wire was the proximate cause of the accident, the electric supply company was not liable. It was held in that case that the injury was really caused by the negligence of the telephone company in allowing its wire to get into such a state of repair that it broke and fell. It follows from this that if a wire were to break and do damage to private property of any kind, the electrical company might be held responsible.

No liability, however, will be incurred in respect of damage which results from an act specially authorized by statute, or which is the necessary consequence of what is so authorized; but for this exception to apply, the power specified by the statute must be strictly adhered to, and if a choice exists as to the manner in which the powers may be exercised, due regard must be had to the individuals or the public affected by the exercise of the powers.[1] Hence if we may again borrow an illustration from the law relating to tramways, if a company has authority to conduct electricity along naked wires or rails, it will not generally be liable for any injury to a person coming into contact with them, nor will it be liable for any injury caused by the accidental breaking of a wire or rail merely by reason of such breakage. Where there is negligence on the part of the company, however—as if wires are allowed to sag so as to be within reach of persons passing along the street—the company will be liable for injuries arising out of such negligence, and in such cases the burden of proving negligence is not on the person claiming damages. In a case from Cape Colony[2] the defendants were owners of a telegraph wire and poles, which they had erected along a street under proper authority. A boy passing along the street either touched accidentally or took hold of a wire hanging from a pole, and his right hand was seriously injured by the electric current. It was given in evidence that the day before the accident the wire was hanging slack within the reach of passers-by, and this had been duly reported by a lineman to his superiors, and that the wires were usually

1. Seward Brice on Tramways, 1902.
2. *Kift v. Town Council of Cape Town*, 1 South African L. J. (1901) 181.

inspected every 4 days. The company was held responsible. It was urged on behalf of the company that the plaintiff had been guilty of contributory negligence, but the Court held that there was a distinction to be observed between contributory negligence in a child and in a man.

Cases of negligence decided in the American and Canadian Courts are exceedingly useful to English lawyers. The effect of these cases is admirably stated in Mr. Robertson's work on "Tramways and Light Railways," 1903, p. 240. Thus. with regard to the care required from owners of electric apparatus, it has been decided that such care should be in proportion to the dangers which it is their duty to avoid, although, as was decided in the case of Perham v. Portland General Electric Company,[1] they are not bound to have perfect apparatus or construction. In another case it was held that a company who have wires and poles in the streets are bound to maintain such poles properly, but are not liable for subsequent defects which inspection would not reveal.[2]

In placing a pole near existing electric apparatus they are bound to take due measures to avoid contact, and to inspect from time to time, in order to keep their apparatus in suitable condition with reference to the previously existing apparatus. Mr. Robertson also deduces the following statement of law from American cases: "Generally, the grant of the privilege to encumber the highway with dangerous electric apparatus imposes a duty not to injure persons lawfully on the highway, and to make the highway substantially as safe for them as it was before, and also to consider the safety of persons, such as workmen, whose employment will naturally bring them into proximity with such apparatus. A storm, which is the immediate cause of the accident, is no excuse where there is such a want of care, but it may be, where there has been reasonable care, and the storm is an extraordinary one."

The case of Royal Electric Company v. Heir (21 *Can. Law Times*, 442, 1901), which was decided by the Court of Appeat of Quebec, well illustrates the obligation of a company contracting to supply electricity. In this case the plaintiff claimed damages for the death of her husband (to whose house the defendant company supplied electricity for lighting purposes) caused by his taking hold of an electric lamp (supplied by the defendant company in the ordinary course of their business) with the intention of turning on the light. The precise cause of the accident was not proved, but it was suggested by the company that it was due to contact between the wire supplied by them with a guy wire of another company's system. Damages were awarded to the plaintiff and an appeal by the company was dismissed, the Court holding that there was negligence on the part of the company, and that the burden of proof of the fact, act or omission constituting negligence was not on the plaintiff.

The cases above referred to are drawn without discrimination from American, English and Colonial Law Reports, as so far as the law of negligence is concerned the judiciary of both countries appears to rely upon similar principles.

With regard to nuisances, it is important to again refer to the provisions of Section 17. It provides, as we have seen, that the undertakers are to do as little damage as may be. It follows that if and in so far as they do more damage than is necessary, or use a process which is (1) not the best known process, or (2) an unapproved process, they are, to that extent, common tort feasors, and amenable to the ordinary law, as well as to any statutory penalties and liabilities which may be imposed.

In dealing with the legal liability for nuisance much that has been said with regard to negligence has to be carefully borne in mind. A nuisance, however, may be created as incidental to the manufacture and supply of electricity. In these circumstances how far is the supply company to be held responsible? In the English case of *The National Telephone Company v. Baker*[3] a tramway was worked on the overhead trolley system. The current, after traversing the trolley wire and the car, returned by the rails and an nuinsulated copper conductor running under the roadway parallel to the rails and connected with each rail. The telephones of the plaintiff company were worked on the single wire system with an earth return. The consequence was that the telephones were rendered practically useless, and the company claimed an injunction to restrain the defendant from using tramways so as to be a nuisance to or interfere with their telephones. The judge who tried the case was inclined to decide in favor of the telephone company, but was prevented from doing so by the fact that the tramway company were protected from actions of this kind by their private act. In coming to the conclusion that the tramway company would have been liable if not so protected, he was guided by the decision in the famous case of *Fletcher v. Rylands*, where it was held that "The person who for his own purposes brings on to his land and keeps there anything likely to do mischief, if it escapes, must keep it at his peril, and, if he does not do so is *prima facie* answerable for all the damage which is the natural consequence of its escape. He can excuse himself by showing that the escape was due to the plaintiff's default; or perhaps that the escape was the consequence of *vis major*, or the act of God."

It is somewhat doubtful whether this principle can be properly applied to the use of electricity. If a man who makes use of delicate electrical apparatus were entitled to prevent a tramway or electric lighting company from doing anything which may affect his instruments, the progress of electricity in its application to great undertakings would be wholly arrested. The doctrine of *Fletcher v. Rylands*, protects a man in the natural use of his property, and it cannot be said that the employment of delicate instruments is a natural use. Of course, the provisions of a particular tramway act may deprive him of his remedy; but it is submitted that wholly independent of statute law a telephone or telegraph company could not succeed.

A recent case in the Privy Council, which came before that august tribunal on appeal from the High Court of Cape Colony would seem to support the view that *Fletcher v. Rylands* must not be pressed too far in connection with electricity. In that case an action was brought by a telegraph company against a tramway company for interference by induction. In deciding for the tramway company, Lord Robertson said: "The appellants cannot claim higher privileges than other owners of land, and cannot create for themselves, by reason of the peculiarity of their trade apparatus, a higher right to limit the operations of their neighbors than belongs to ordinary owners of land who do not trade with telegraph cables." It is true that this decision was based not upon English law but upon Cape Dutch law; but it is important to notice that the sound principle which underlies it has long been adopted in the United States. In the case of *Cumberland Telephone and Telegraph Company v. United Electric Railway Company*[1] it was held that a telephone company could not restrain an electric railway company where the escape of electricity from the wires of the railway company was incident to the conduct of their business, and where the telephone company could protect itself at much less expense than would be incurred by the railway company in preventing the escape of electricity. It may therefore be assumed that in future English judges will administer the law as it has been laid down in the Capetown Tramway case.

Further, the principle there laid down is consistent with what is usually recognized as a correct statement of the law of nuisance in England. Thus, Mr. Garrett, in his work on the law of nuisances, states: "If the owner of land uses it for any purpose which from its character may be called non-natural user, such, as for example, the introduction on to the land of something which in the natural condition of the land is not upon it, he does so at his peril, and is liable if sensible damage results to his neighbor's land, or if the latter's legitimate enjoyment of his land is thereby materially curtailed."

It might also be mentioned that a telephone company cannot claim any monopoly in the use of the earth for the purposes of return currents. At least the law has been so decided in a number of American cases that a telephone company has no vested interest in or exclusive right to the use of the "ground circuit" or "earth return" as against an electric street railway authorized by statute.[2]

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. ARTHUR B. ALLEN, son of Mr. B. J. Allen, of the Brookline (Mass.) Gas Light Company, has accepted a responsible position with the Penn Yan (N. Y.) Gas Company.

COL. FRANK S. RICHARDSON has resigned the Presidency of the Hoosac Valley (Mass.) Street Railway, which move was made solely because the gas and electric lighting of North Adams, Adams and Williamstown, Mass., have gone to the point that demands all the time the Colonel has to devote to business.

THE Philadelphia Commercial Museum, writing under recent date, propounds the following: "We have received a communication from the United States Consul, Beirut, Syria, in which he advises us that one of the leading merchants of Beirut has bought the Beirut City Gas Works and the exclusive franchise of the same, good for some 60 or 70

1. (1898) 33 Or. 451.
2. City of Denver v. Sherett (1898) U. S. C. C., Col.
3. (1893) 2 Ch. 186.

1. (1890) U. S. C. C., Tenn.
2. (*Cincinnati Inclined Plane Railway Company v. City and Suburban Telegraph Association*, 48 Ohio State Rep., 390.)

years. He is anxious to secure the services of an expert who knows the cheapest methods of producing gas from coal and other substances, and prefers an American for this purpose. To the right person a salary of $3,000 a year on a 5-year contract will be given, besides a free house, light, fuel and carriage. A knowledge of the French language would be desirable, but not absolutely necessary. This appears to us like a good chance for the right person, and we take the liberty of writing you to ask if you know of anyone who could be recommended to fill this position. * * * ." Those concerned may address "The Philadelphia Commercial Museum," care Mr. Dudley Bartlett.

In connection with the above, inquiries may be addressed to Mr. Walton Clark, third Vice-President, United Gas Improvement Company, Philadelphia, Pa.

The Wm. M. Crane Company informs us, through the medium of the "Trade Paper Advertising Agency," that it is fully up to immediate delivery of orders for its specialties.

Mr. E. A. Pinkney, Superintendent of the Sag Harbor (N. Y.) Lighting Company, forwards the following: "This Company intends giving a week's series of lectures and demonstrations on the art of cooking by gas, beginning Monday, April 25. We have secured the services of that well taught artist along the lines indicated, Miss Emily L. Lemcke, of the Greater New York Cooking School, have availed ourselves freely of advertising in modern shape, have issued special invitations, circulars and the like, and are sure that the methods adopted will bring to our sessions enthusiastic and commonsense housekeepers, whose teaching will add largely to increasing our output. Our present consumption is more than double that of a year ago."

The Company proposes to give two lectures each day, at 2.30 and 7.30 P.M. respectively.

Mr. W. E. Hartman has resigned the position of General Superintendent of the City Gas Company, of Norfolk, Va., to accept a similar position with the Joliet (Ills.) Gas Light Company. Good luck to him.

The Gas Machinery Company, of Cleveland, O., has been awarded a contract for the placing of the coal gas apparatus and purifying system to be installed in the new plant at Bay City, Mich. The rated capacity of the installation is 750,000 cubic feet per day.

The Bristol Company, of Waterbury, Conn., informs us that it is sending an exhibit to the World's Fair at St. Louis, which will be located in Electricity Building. The booth will be located close to the main entrance in space 36, and the Company will there show a complete line of its recording instruments for pressure, temperature and electricity, which instruments will be displayed in various styles and sizes and in different finishes. The constructive and operative parts will also be shown, and a large number of the instruments will be in actual operation, enabling visitors to observe the manner of operation and the records made; also their extreme simplicity together with the delicacy and accuracy possible to obtain without sacrificing any of the necessary elements essential in a commercial form of recording apparatus. There will also be shown a complete line of specimens of the Bristol patent steel belt lacing, which comprises over 150 different sizes for all kinds of belting, from the thinnest to the heaviest manufactured, or such as those used for conveying belts.

The authorities of Richmond, Va., have made the necessary appropriation for the construction on the municipal gas works site of an additional storage holder. It will likely have a capacity of 1½ millions cubic feet.

Mr. A. A. Houser has been appointed Superintendent of the works of the Beaumont (Tex.) Gas Company.

The charge of embezzlement made by the American Gas Company, of Philadelphia, against its former Assistant Secretary and Treasurer, has been withdrawn.

Mr. J. H. Findlay has worked wonders in the rejuvenation of the plant at Charlotte, Mich., since he assumed charge there in 1902.

Mr. J. F. Lawless has resigned the position of Manager to the San Francisco Gas and Electric Company.

On the 1st prox., the selling rate at Lexington, Ky., will rule at $1 per 1,000 cubic feet, a concession of 25 cents per 1,000.

Mr. J. J. Breitinger, of Cleveland, O., has been awarded a franchise for the construction and operation of a gas works at Princeton, Ind. The franchise is to run for 50 years.

Manager Atkinson, of the Goshen (Ind.) Gas Company, has been authorized to reconstruct the plant. The scheme includes the erection of a storage holder.

Governor Bates, of Massachusetts, has signed the bill authorizing a consolidation of the Marlboro and Hudson Gas Light Companies.

The Citizens Gas Company, of Quincy, Mass., has secured a plot of land in South Quincy, just south of the old pumping station of the Water Company, on which it is proposed to construct a new plant.

The Centralia (Ills.) Gas and Electric Company has made formal certification of the fact that its capital stock has been increased from $150,000 to $250,000.

The following is from the Louisville (Ky.) *Courier-Journal*, of recent date: "The Kentucky Heating Company has announced an increase in the price of its gas. A statement, signed by Donald McDonald, President of the Company, has been mailed to each customer, and the reason given for the change in price is that the Louisville Gas Company is tapping the natural gas field and willfully proceeding to destroy it (?) by piping it to Louisville and selling it at a loss. The evident object, says Mr. McDonald, is to exhaust the natural gas and put the Heating Company out of business. It is the intention of the Heating Company, according to the statement given out, to prepare to manufacture gas out of oil and furnish it at a low rate to consumers of natural gas. Oil being high at present the Company says it is compelled to raise the price and has fixed a sliding scale, to go into effect May 23." The schedule will shortly be published.

The *Journal of Gas Lighting*, in an editorial on "The Attendance of Gas Officials at Fires," says: "The disastrous fire in the city of Baltimore, which is reported to have cost British Fire Insurance Companies alone upwards of a couple of millions sterling, furnishes ample evidence of the fact that, with all our modern improvements in building construction, and the large extension of electric lighting, the risk of fire in large collections of buildings is still very considerable. So far as the available information extends, the gas supply of Baltimore, or the gas works, had no more to do with the origin or spread of the conflagration than the general use of electricity in the city had in preventing or limiting its ravages. It is as well to place this observation on record; because the presumed superiority of electric light to gas from the fire standpoint is so tremendously overworked, in the newspapers and in public discussions, that the general impression undoubtedly is that in the use of the former illuminant there is comparative safety. The truth of the matter is, that when it is a question of really serious fire, no such element of causation as this possesses any magnitude whatever. The origination of many great conflagrations is in itself insignificant. Time and again there are outbreaks, such as the recent gas main fire in Piccadilly, which, if there were any rule of proportion in the scheme of causation, ought to do a deal of mischief; but they do not. On the other hand, somebody throws down a lamp, or even a lighted match, and a town is swept out of existence. What we wish to lay stress upon, in the present instance, is the great importance of a thorough understanding being arrived at betimes between the Fire Departments of large towns and the lighting authorities—especially the gas company. This agreement should cover all the detail points of the attendance of gas officials at fires with a view to cutting off work, the danger of 'gassing,' and other matters. Of course, in most well organized cities this is attended to; but, still, exceptional cases occur occasionally to prove that the understanding that should have existed between the firemen and the gasmen was wanting. It would be highly regrettable if anything of the kind were to arise on a large scale, or on an important occasion. The necessity of seeing to the emergency lighting by gas of railway tunnels in towns, theaters, and the like, has frequently been urged in these columns; and it is to be hoped that it is not overlooked. Many an engineer, we feel quite certain, when going into a crowded assembly in some unfamiliar building, is reassured by the sight in the corridors of the trustworthy flat-flame gas light indicating a way to safety. It is worth knowing that at Baltimore the well known mill, or 'slow burning,' building construction of staircases and floors in solid wood beams, did not justify itself. Reinforced concrete seems to have answered best. But the most striking lesson of all was the value of shuttered, or even wire glazed, windows in preserving buildings fitted with them."

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ALBERT P. CALLENDER,
EDITORS.

MONDAY, APRIL 25, 1904.

The Market for Gas Securities.

Those who bought Consolidated Gas last week have shared with the market the profit that comes from hope. In other words, the Simon-pure speculators went in and got out, quite to the good; but the tug is still on, in that the son of his father has not signified his intentions in respect to the Remsen measure. That is, he had not done so publicly up to 2:45 this P.M., Friday. The stock was hanging fire all day, but profit takers were responsible for the drop. There is no good reason why, in the interest of the people whom he governs as chief magistrate of the third city in the world, that he should not sign the "gas grab," the enactment of which will permanently put other grabbers in the gopher hole. The stock sold above 210 last week, and closed at 208 to 208¼, and it is worth very much more, whether the Mayor signs the bill or not.

Brooklyn Union was well to the fore this week. It closed at 208 to 210. Baltimore Consolidated has increased its dividend rate from 3 to 4 per cent. per annum, and it is well held above 72¼. Peoples, of Chicago, is 97⅛ to 97⅜, and it is cheap at the figures named. Lacledes are dull, and Bay State is as it has been and as it will be.

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STOCKHOLDERS' MEETING.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., April 20, 1904.

The Annual Meeting of the Stockholders of the United Gas Improvement Company will be held at the Company's office, northwest corner of BROAD AND ARCH STREETS, PHILADELPHIA, Monday, May 2, 1904, at 12 o'clock, noon, when an electing will be held for a President and six (6) Directors, to serve for the ensuing year, and such other business transacted as may be brought before the meeting.

The stock transfer books will be closed from 3 P.M., Tuesday, April 26th, until 10 A.M., Tuesday, May 3d.

1507-1 LEWIS LILLIE, Secretary.

Position Wanted.

YOUNG MAN, with considerable experience and best of references, would like position with gas company. Knows how to sell ranges and other appliances. Idea of working for promotion Address, "GAS," 207 Brown Block,

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Wanted, Position
AS SUPERINTENDENT,

By a first-class gas engineer and superintendent. Understands the manufacture of coal and water gas; also. the laying of high and low pressure mains, in detail. Is a first-class hustler for new business. Can furnish required reference. Address, "UP-TO-DATE,"

1505-4 Care this Journal.

Wanted, Position
AS MANAGER

Of gas, or gas and electric light plant, by a man who can show first-class results in former positions. South or Southwest preferred.

1494-tf Address, "T. W.," care this Journal.

MECHANICAL DRAUGHTSMAN.

Young man, 8 years' experience on gas works construction and structural ironwork, wants position. Address, "BOX 7,"

1507-2 Care this Journal.

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For a Small, Modern Lowe Plant

In a growing Western town. A fine opening for an energetic, capable man. Address, giving age and references,

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Will consider propositions to lease or buy a small gas or electric light plant in a town of 30,000 inhabitants, or less.

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Ironwork for 9 benches of 6's; hydraulic mains, 24 inches by 24 inches, with diaphragm and cleaning pockets; plain mouthpiece, 14 inches by 21 inches; 6-inch stand, straddle and dip pipes. Address,

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Above all in good working order. Will sell cheap if taken at once.

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One Section Wrought Iron Hydraulic Main, with Stiness tar take-off, for 3 benches of 6's.

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Standpipes, Bridgepipes, Mouthpieces with Self-sealing Lids, for 7 benches of 6's.

One Sinuous Friction Condenser.

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Four Purifiers, 10 by 16 by 3; complete. Connections to above apparatus, 10-inch.

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1506-tf PAWTUCKET, R. I.

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We have information and data to the effect that brass goods are being manufactured in imitation of Mueller brass goods, and that said goods are being marked in imitation of Mueller brass goods, which bear a trade-mark whose essential feature is the letters "H M;" and also that such goods are being offered and sold in substitution for genuine Mueller goods. All of this is not only an infringement upon our trade-mark rights, but is also unlawful and unfair competition employed to deceive the public and to effect the sale of inferior goods in place of goods having the established reputation for merit possessed by the Mueller goods.

We are also in possession of information that certain stop and waste cocks have been put out in infringement upon our letters patent, No. 513,372.

PROTECTING OUR RIGHTS.

We are determined to proteot our trade against such fraudulent imitations of our goods to the full extent of the law, and it is our intention to bring suit promptly against all infringement upon either our patent or our trade-mark rights.

SUITS OF INFRINGEMENT.

To this end we have already instituted two suits for infringement against the A. Y. McDonald & Morrison Manufacturing Company, of Dubuque, Ia.

WARNING TO MANUFACTURERS.

We hereby give warning to all manufacturers that we propose by every means accorded by the patent laws to determine our patent and trade-mark rights and to enforce them vigorously against infringers, and that we shall iustitute suit against any manufacturer who may in any degree violate our rights.

WARNING TO THE TRADE.

We hereby give warning that any buyers of goods that infringe upon any of our patent or trade-mark rights are themselves liable for infringement, and that they also will be prosecuted to the full extent of the law.

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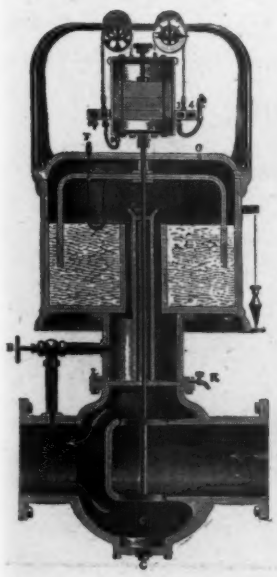

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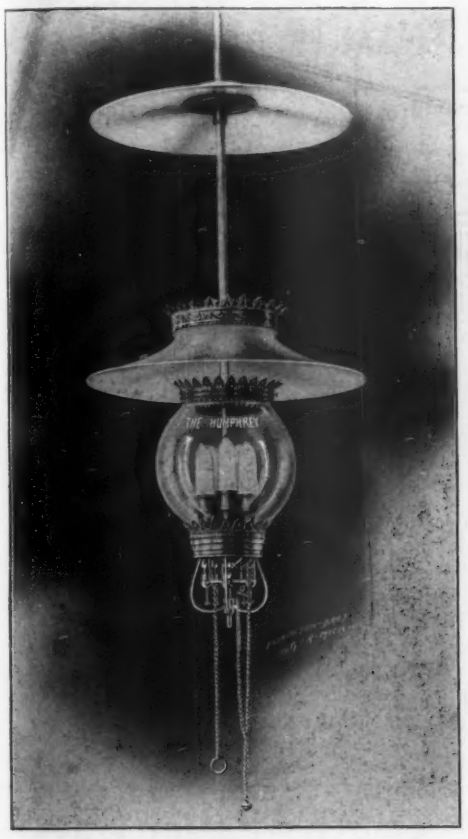

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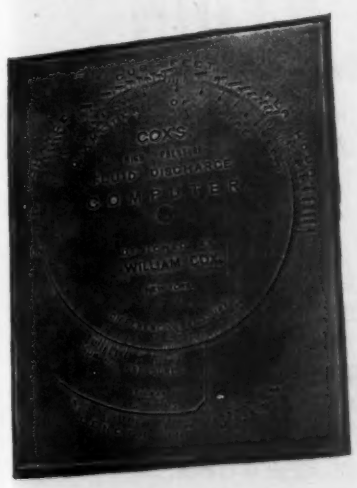

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L = length of pipe in miles,
w = specific gravity of the fluid when air = 1.

To Find the Discharge from a Pipe and the Required Size of Pipe.

(1.) Set the specific gravity of the fluid opposite the length of pipe;
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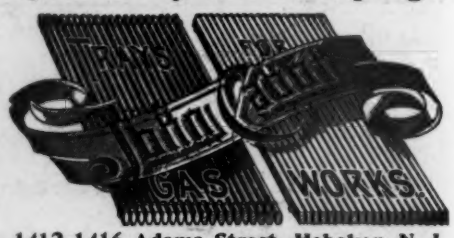

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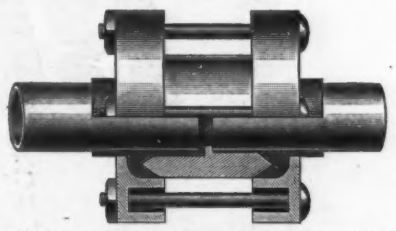

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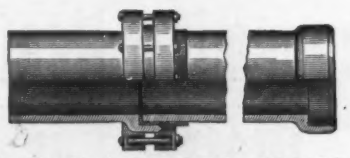

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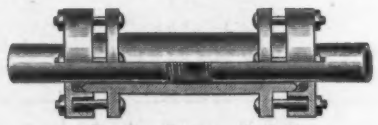

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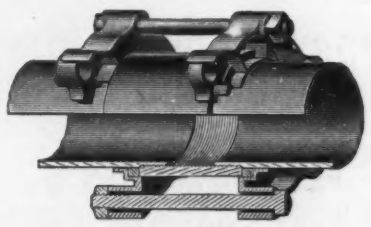
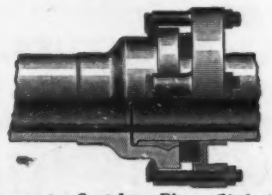


Clamp. Style 4.



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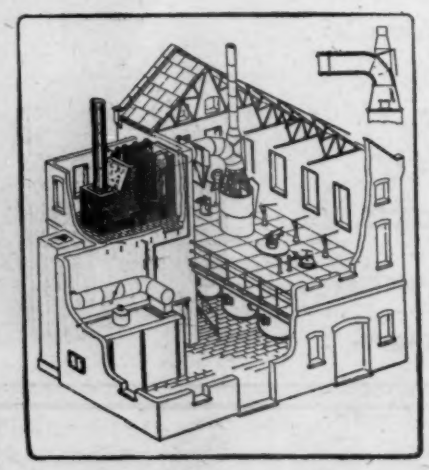

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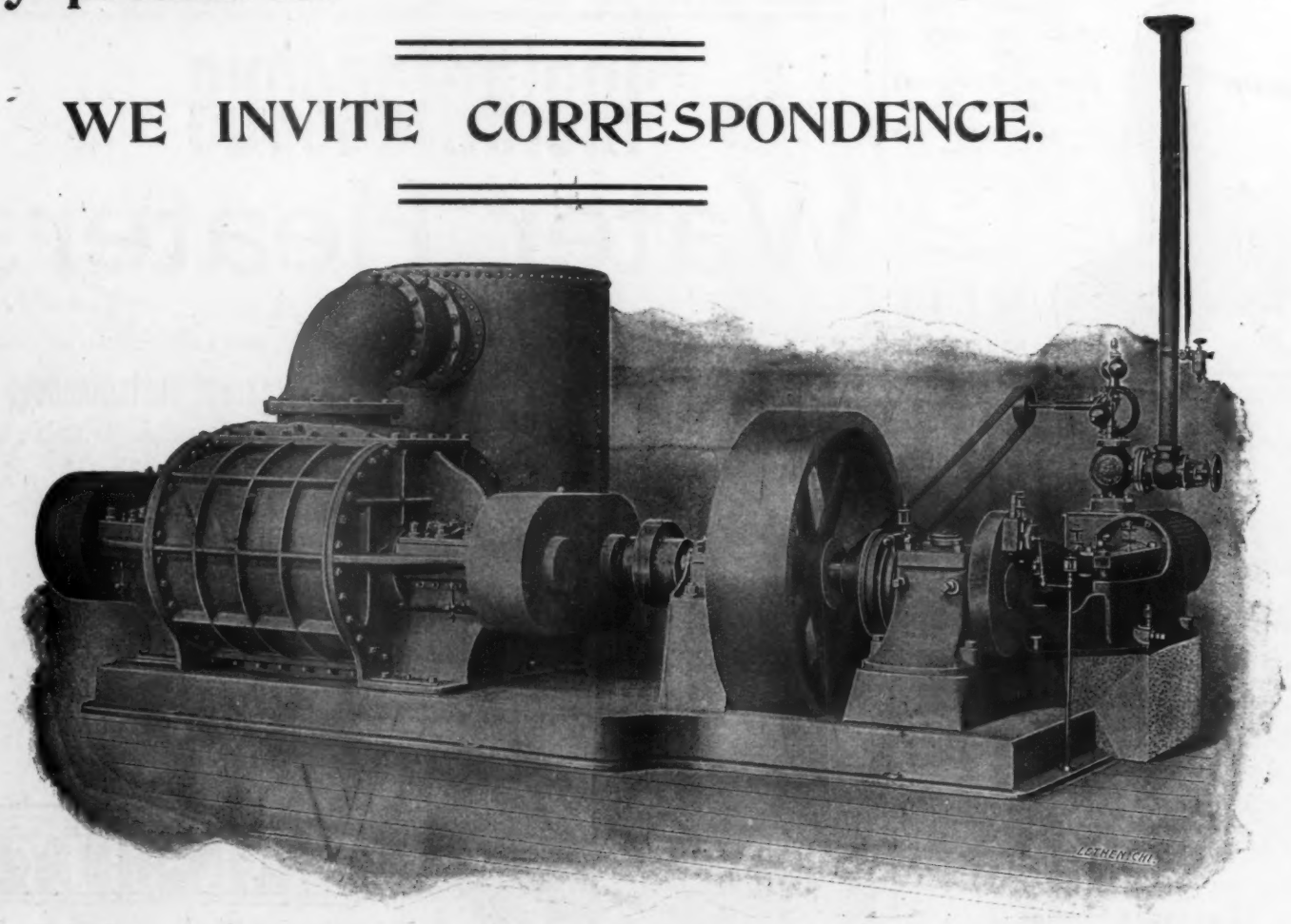

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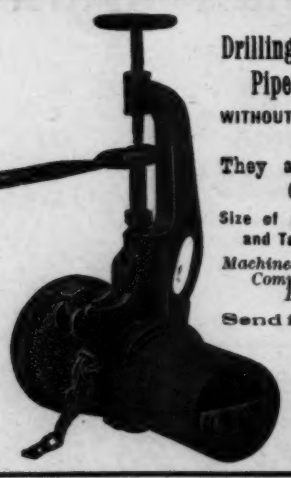

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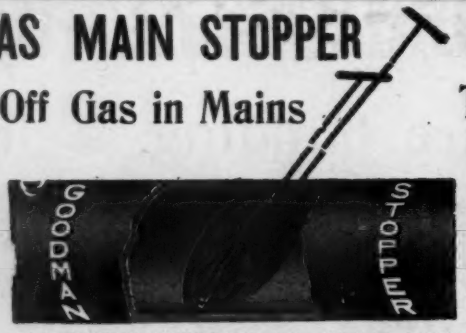

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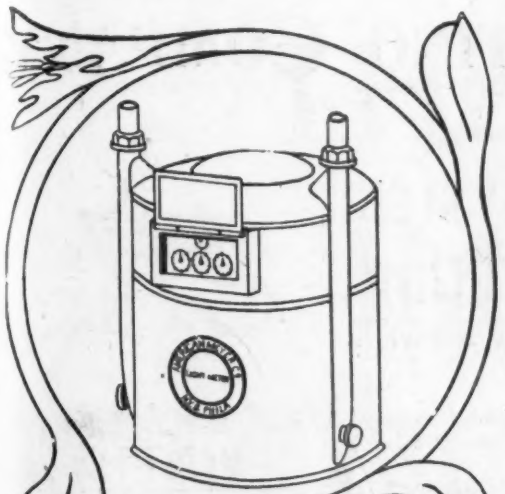

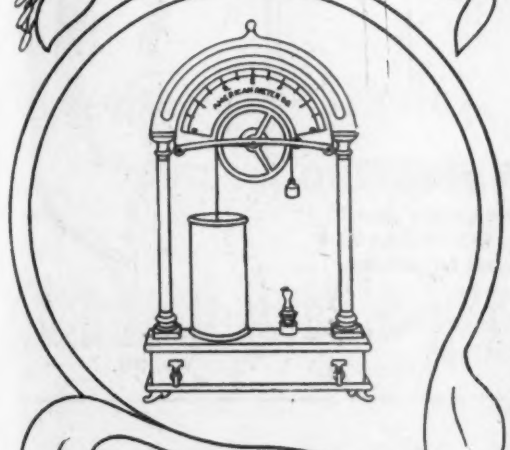

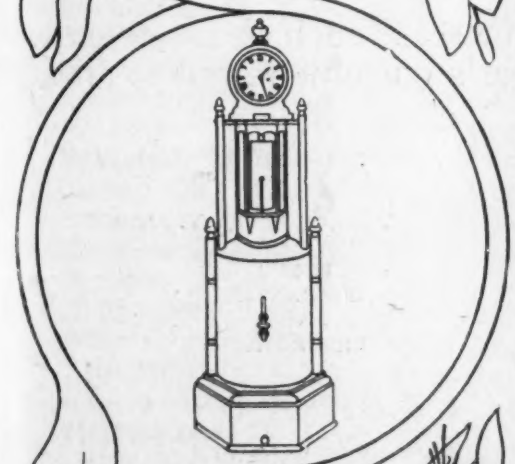

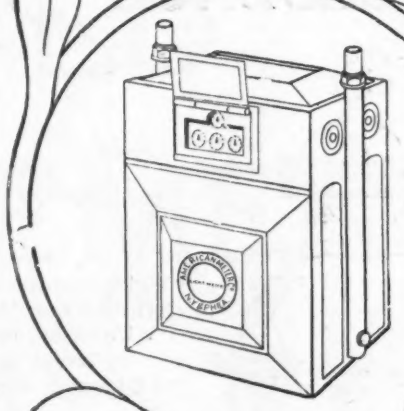

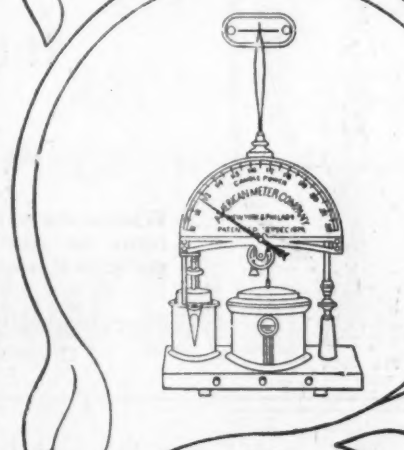

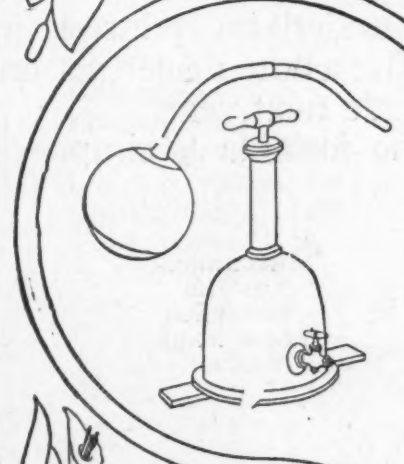

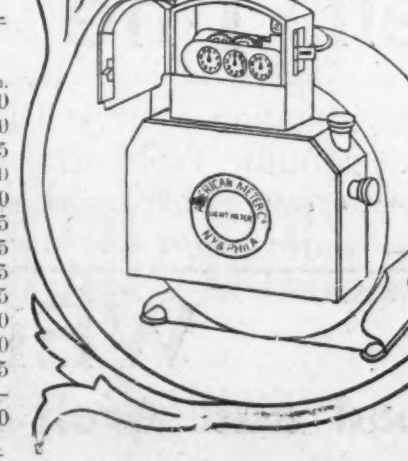

PUBLIC LIGHTING TABLE.

MAY, 1904.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
				P.M.	A.M.
Sun.	1	7.30 PM	9.50 PM	6.45	4.00
Mon.	2	7.30	10.50	6.45	4.00
Tue.	3	7.30	11.40	6.45	4.00
Wed.	4	7.30	12.30 AM	6.45	4.00
Thu.	5	7.30	1.10	6.45	4.00
Fri.	6	7.30	1.50	6.45	4.00
Sat.	7	7.30 LQ	2.20	6.55	3.40
Sun.	8	7.30	2.50	6.55	3.40
Mon.	9	7.30	3.20	6.55	3.40
Tue.	10	7.30	3.50	6.55	3.40
Wed.	11	7.30	3.50	6.55	3.40
Thu.	12	7.30	3.50	6.55	3.40
Fri.	13	7.30	3.50	6.55	3.40
Sat.	14	7.30 NM	3.50	7.00	3.30
Sun.	15	7.40	3.40	7.00	3.30
Mon.	16	7.40	3.40	7.00	3.30
Tue.	17	7.40	3.40	7.00	3.30
Wed.	18	7.40	3.40	7.00	3.30
Thu.	19	10.10	3.40	7.00	3.30
Fri.	20	10.50	3.40	7.00	3.30
Sat.	21	11.30 FQ	3.40	7.10	3.15
Sun	22	12.10 AM	3.40	7.10	3.15
Mon.	23	12.50	3.40	7.10	3.15
Tue.	24	1.20	3.40	7.10	3.15
Wed.	25	2.00	3.40	7.10	3.15
Thu.	26	2.40	3.40	7.10	3.15
Fri.	27	No L.	No L.	7.10	3.15
Sat.	28	No L. FM	No L.	7.15	3.15
Sun.	29	No L.	No L.	7.15	3.15
Mon.	30	7.50 PM	9.30 PM	7.15	3.15
Tue.	31	7.50	10.20	7.15	3.15

TOTAL HOURS LIGHTING DURING 1904.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	225.00	January	423.20
February	205.40	February	367 40
March	187.40	March	355.35
April	169.50	April	298.50
May	152.30	May	264.50
June	137.20	June	234.25
July	138.50	July	243.45
August	151.00	August	280 25
September	164.40	September	321.15
October	191.30	October	374.30
November	210.30	November	401.40
December	237.10	December	433.45
Total, yr.	2171.40	Total, yr.	4000.00

NEW YORK, 33 Nassau Street. BOSTON, 814 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

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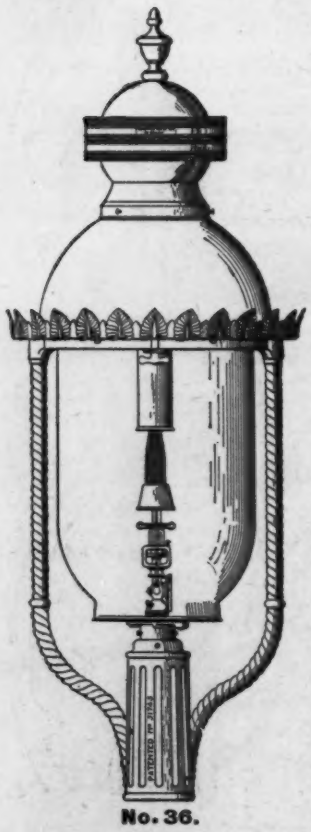
.... OF AMERICA ....



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No. 38.

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The formula is simple-

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Aberdeen, S. D.	Boone, Ia.	Easton, Pa.
Winsted, Conn.	Pueblo, Col.	Lawrence, Mass.
Canon City, Col.	Charlotte, N. C.	Council Bluffs, Ia.
Schenectady, N. Y.	Fall River, Mass.	Chattanooga, Tenn.
Hagerstown, Md.	Duluth, Minn.	Tuckerton, N. J.
Malden, Mass.	New York (Mutual Co.)	Springfield, O.
Bridgeport, Conn.	Waltham, Mass.	Easton, Pa. (2d contract).
Albert Lea, Minn.	Dover, Del.	Mobile, Ala.
Brooklyn, N. Y.	York, Pa.	Conshohocken, Pa.
Kansas City, Kas.	Minneapolis, Minn.	Mason City, Ia.
Hempstead, N. Y.	Allentown, Pa.	

TOTAL SETS FOR 1903, ... 62
TOTAL DAILY CAPACITY, ... 62,950,000 cubic feet.
TOTAL SETS TO DATE, ... 508
TOTAL DAILY CAPACITY, ... 362,780,000 cubic feet.

The United Gas Improvement Company,

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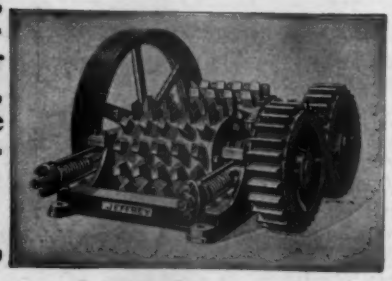

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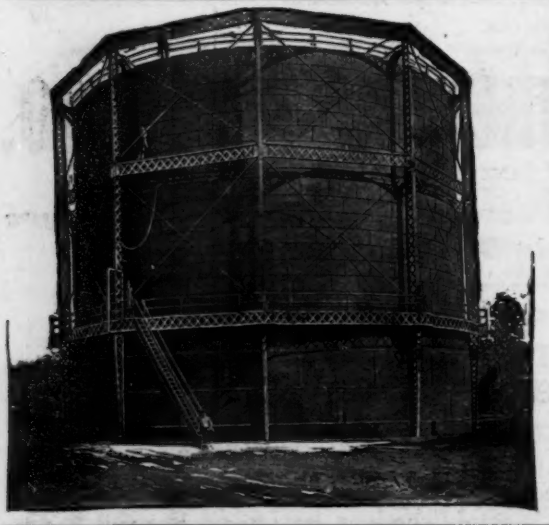

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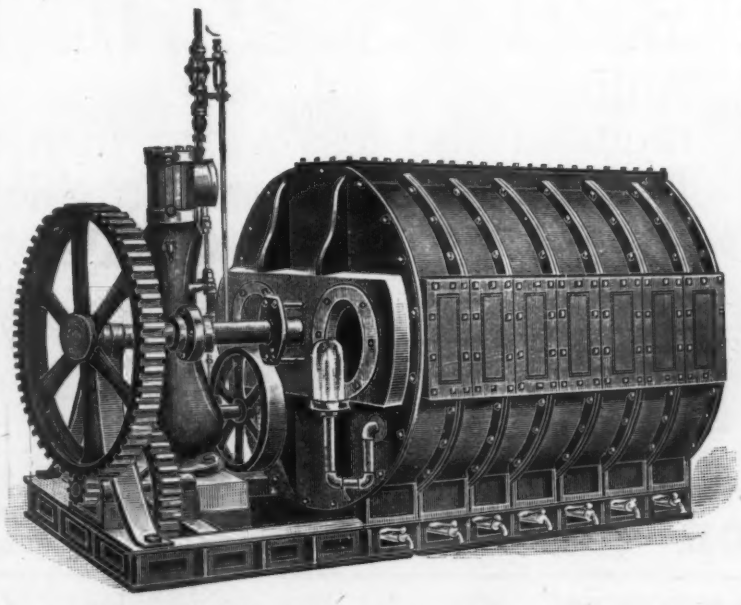

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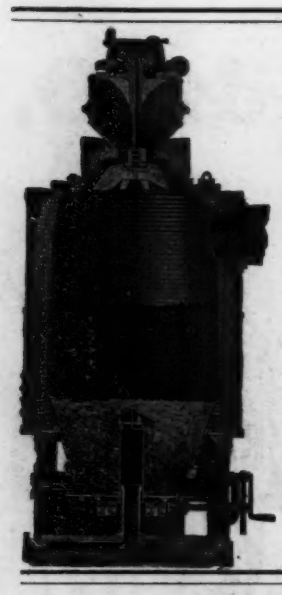

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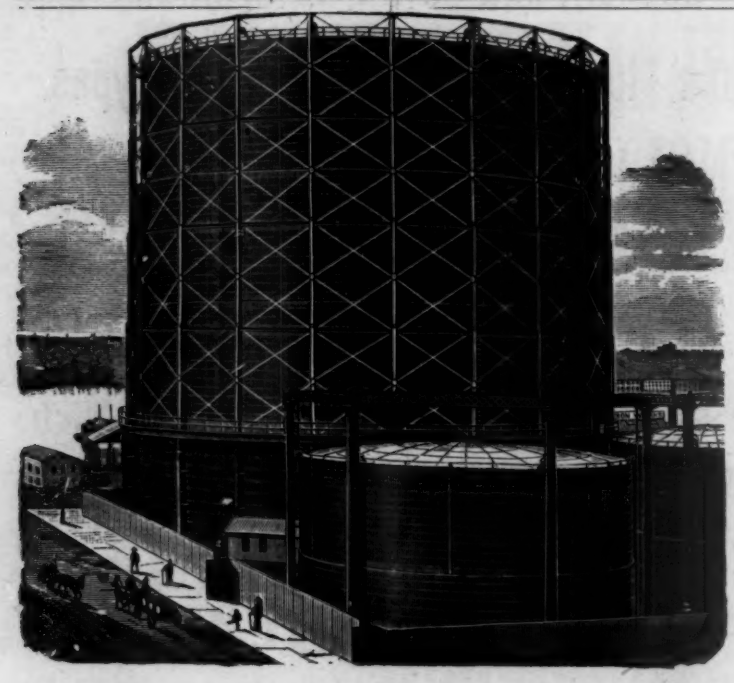

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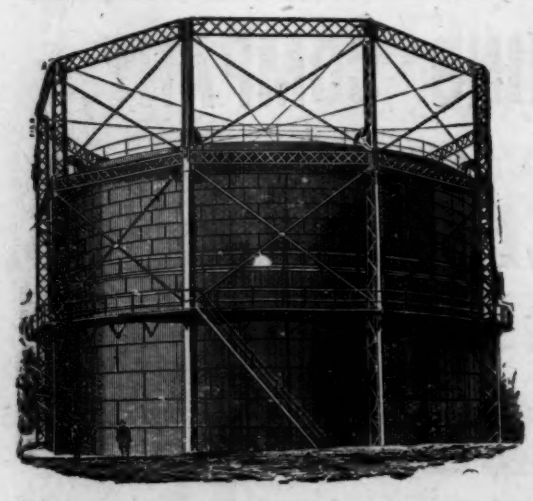

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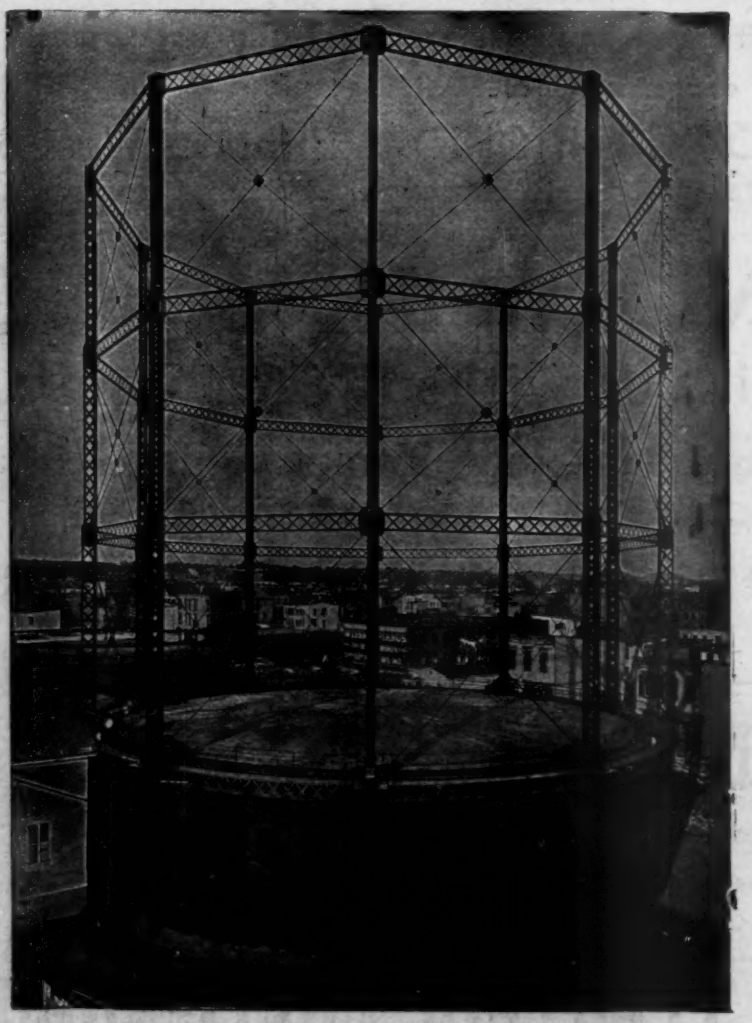

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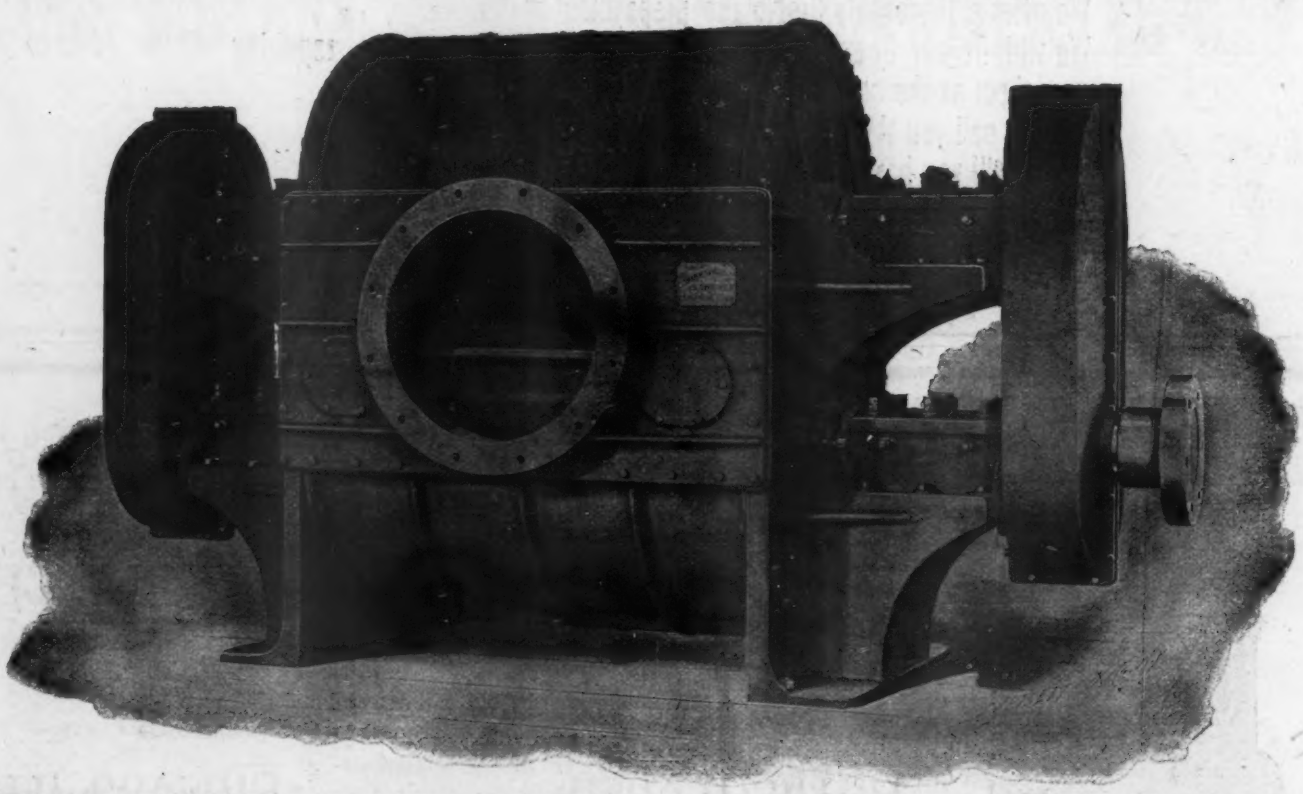

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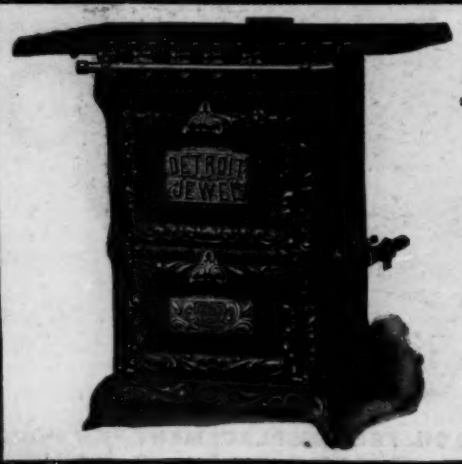

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